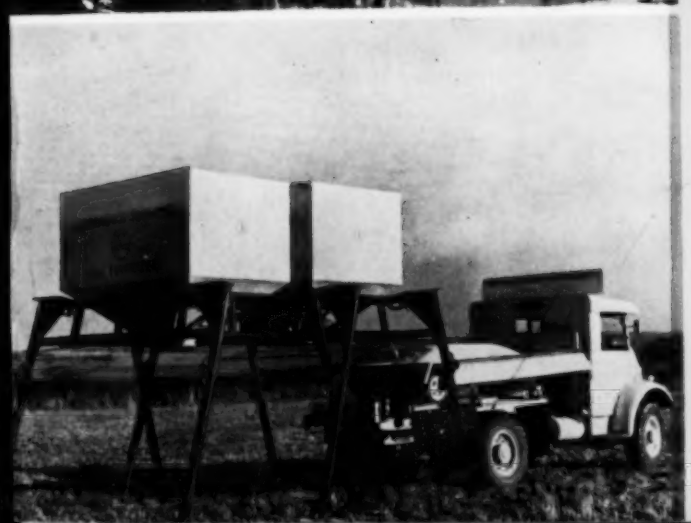
AGRICULTURAL CHEMICALS



In this issue:

August 1961

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No doubt about it—under hard usage Chase bags pay off in better protection for your product. One reason—their strength, toughness, impact resistance and other basic qualities are assured by rigorous testing in the Chase Standards Laboratory. Another reason—Chase's policy is to use only the finest materials available, carefully selected from the best of *many* market sources. You pay no more for this extra assurance of quality—it comes as "part of the package" from Chase. Got a packaging problem? Call your Chase Man for prompt, courteous assistance.

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** A Chase Bag will make your product a Very Important Package*

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AND OTHER PACKAGING MATERIALS

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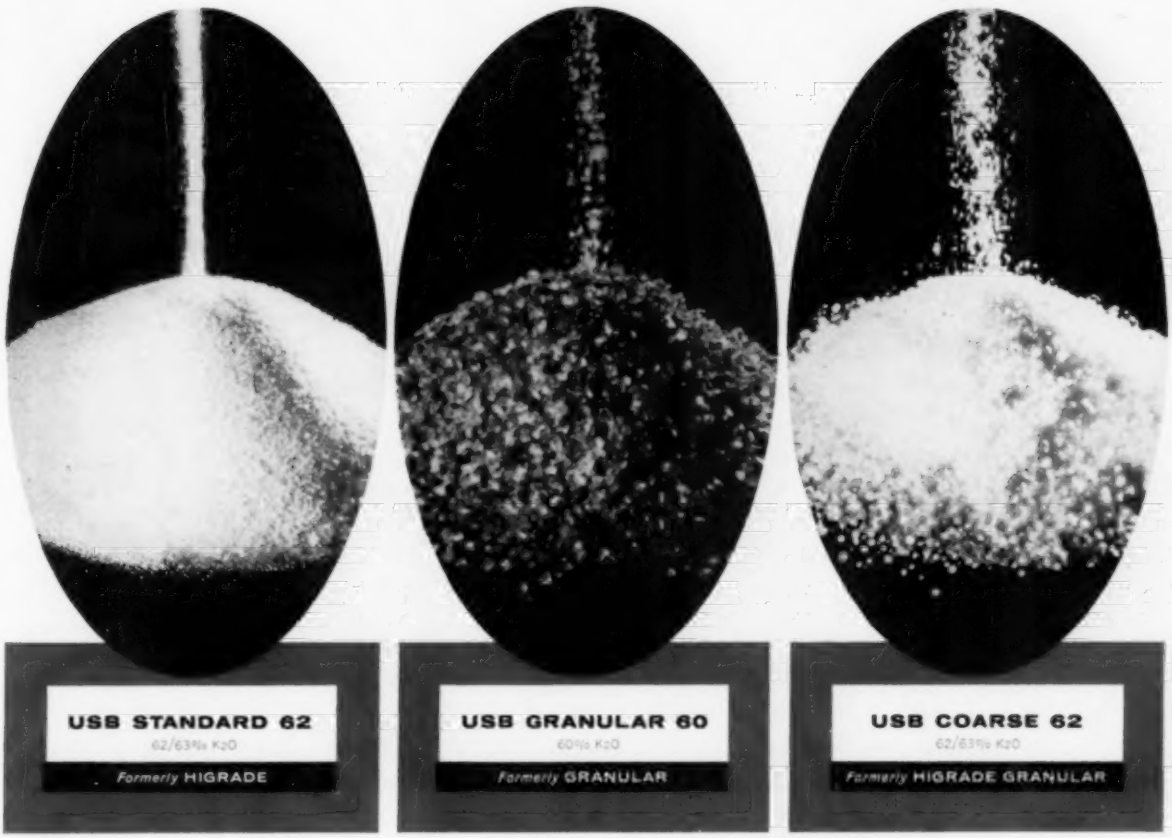

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Each of our three types of high quality muriate of potash is ideally sized to meet your particular manufacturing requirements. Both of the white grades – STANDARD and COARSE – contain the highest possible K_2O (62/63%) and make feasible the manufacture of the highest analysis mixtures. Our GRANULAR 60 is ideally suited for mixtures requiring muriate of a larger particle size . . . or for direct application. All three products are refined to assure free-flowing and non-caking properties during handling and storage.

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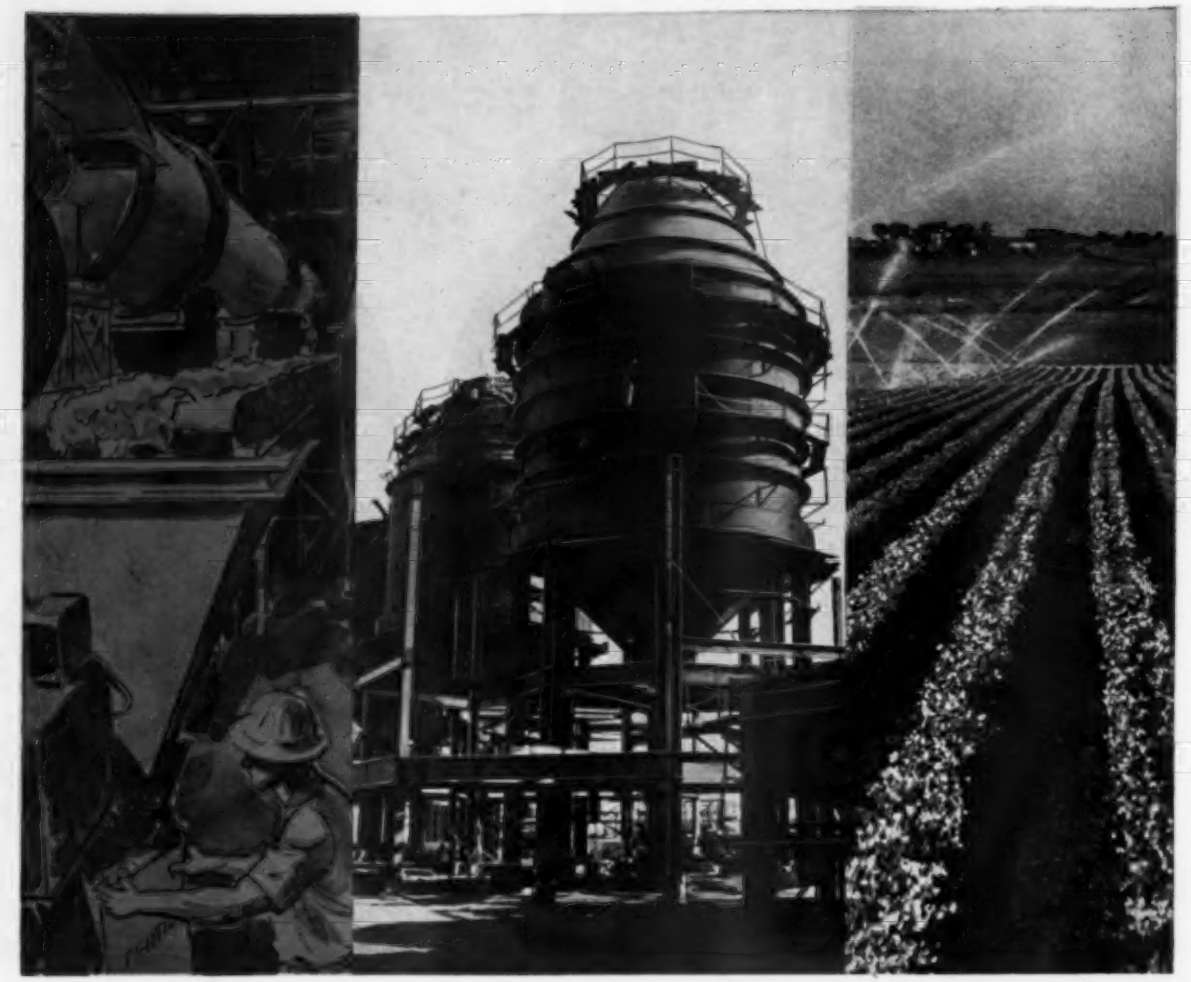

3-WAY BOOST IN POTASH

INCREASED PRODUCTION OF TRONA® MURIATE WILL SOON MEAN BETTER SERVICE...BETTER MIXED FERTILIZERS...HIGHER YIELDS OF QUALITY CROPS

Increased production of Muriate of Potash at Trona will be measured in three-way benefits. Expanded potash facilities, shown above, will soon make available from AP&CC more tonnage of free-flowing, uniform granule size Trona potash in granular and regular grades for agriculture's expanding needs. To the mixer, more quality potash from Trona will mean a better finished product . . . and to the grower, higher yields of quality crops.

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This Month's Cover

The growing production and use of fertilizers in the United Kingdom is reflected in this month's cover which shows an aerial view of a huge Canadian fertilizer plant (see page 28), and a new bulk fertilizer distribution system being demonstrated in England. Story on page 54.

AG CHEM

Vol. 16, No. 8 August, 1961

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That's how fast you can open a Bemis Multiwall with Bemi-Strip closure. Just grab the red tab and pull. The bag opens quickly, easily.

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SYMBOLS OF PLANT LIFE

HIGH-K

A 20TH CENTURY SYMBOL FOR HIGHEST QUALITY POTASH

In the middle ages, working with little help from prior research, alchemists frequently developed materials by accident.

TODAY, MATERIALS ARE DEVELOPED BY PLAN TO MEET A NEED—JUST AS EACH TYPE OF HIGH-K MURIATE IS MADE TO MEET SPECIFIC REQUIREMENTS.

STANDARD HIGH-K MURIATE IS TAILOR MADE FOR CONVENTIONAL FERTILIZER MANUFACTURE AND VARIOUS RATIOS OF GRANULATED GRADES. IT FEATURES UNIFORM PARTICLE SIZE RANGE AND CHEMICAL ANALYSIS.

COARSE HIGH-K MURIATE IS USED IN THE MANUFACTURE OF CONVENTIONAL FERTILIZER AND IS ESPECIALLY USEFUL IN GRANULATION PLANTS. REASON: A CRYSTAL STRUCTURE WHICH DOES NOT BREAK DOWN WHEN ACIDS AND OTHER LIQUIDS ARE USED IN FORMULATION.

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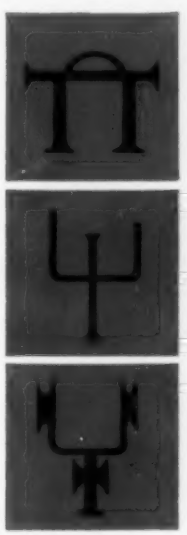
OUR PLANT PROCESSES ARE CONTINUALLY BEING MODERNIZED TO SUPPLY TYPES OF MURIATE NEEDED AND PREFERRED BY FERTILIZER MANUFACTURERS. ON SCHEDULE SHIPMENT, CAR AFTER CAR, DAY AFTER DAY, IS MAINTAINED THROUGHOUT THE YEAR.



Medieval alchemists' symbols for potash and cribbled ashes

SOUTHWEST POTASH CORPORATION

1270 Avenue of the Americas, New York 20, N.Y.

MEETING CALENDAR

Aug. 7-9—Symposium on Pesticide Residues, 18th International Congress of Pure and Applied Chemistry, Montreal, Canada.

Aug. 16-20—Canadian Fertilizer Association convention, Manoir Richelieu, Murray Bay, Quebec.

Aug. 27 - Sept. 1 — Annual Joint Meeting of Biological Societies, Purdue University, Lafayette, Ind.

Sep. 3-8 — 140th National Meeting, American Chemical Society, and National Chemical Exposition, Chicago.

Sept. 7-9 — Special Symposium on Herbicides and Their Use in Forestry, Oregon State University, Corvallis.

Sept. 18-20—Canadian Agricultural Chemicals Assn., 9th Annual Meeting, Mont Tremblant Lodge, Mont Tremblant, Quebec.

Oct. 2-6—National Hardware Show, McCormick Place, Chicago.

Oct. 4-6 — Southeastern Fertilizer Conference, Atlanta Biltmore Hotel, Atlanta, Ga.

Oct. 9-10 — Four-State Applicators & Chemical Conference, Chinook Motel and Tower, Yakima, Wash.

Oct. 9-11—Western Agricultural Chemicals Association, Annual Meeting, Hotel Claremont, Berkeley, Calif.

Oct. 12-13—Northeastern Fertilizer Conference, Schine Inn, Chicopee, Mass.

Oct. 16-18 — Entomological Society of Canada, Entomological Society of Quebec, Joint Meeting, Quebec, P.Q., Canada.

Oct. 16-20—Fertilizer Sessions, National Safety Congress, Pick-Congress Hotel, Chicago.

Oct. 20-22 — Eastern Lawn, Garden, and Allied Products Trade Show, Coliseum, New York.

Oct. 29-Nov. 1 — National Agricultural Chemicals Association, 28th Annual Meeting, The Homestead, Hot Springs, Va.

Oct. 30-Nov. 1—National Fertilizer Solutions Association, Annual Convention, Edgewater Beach Hotel, Chicago.

Nov. 2-3 — Pacific Northwest Plant Food Association, annual convention, Hotel Gearhart, Gearhart, Oregon.

Nov. 6-7 — Annual Weed Conference, Washington State Weed Association, Chinook Motel and Tower, Yakima, Wash.

Nov. 7-10 — British Insecticide & Fungicide Conference, Brighton, England. Sponsored by Association of British Manufacturers of Agricultural Chemicals.

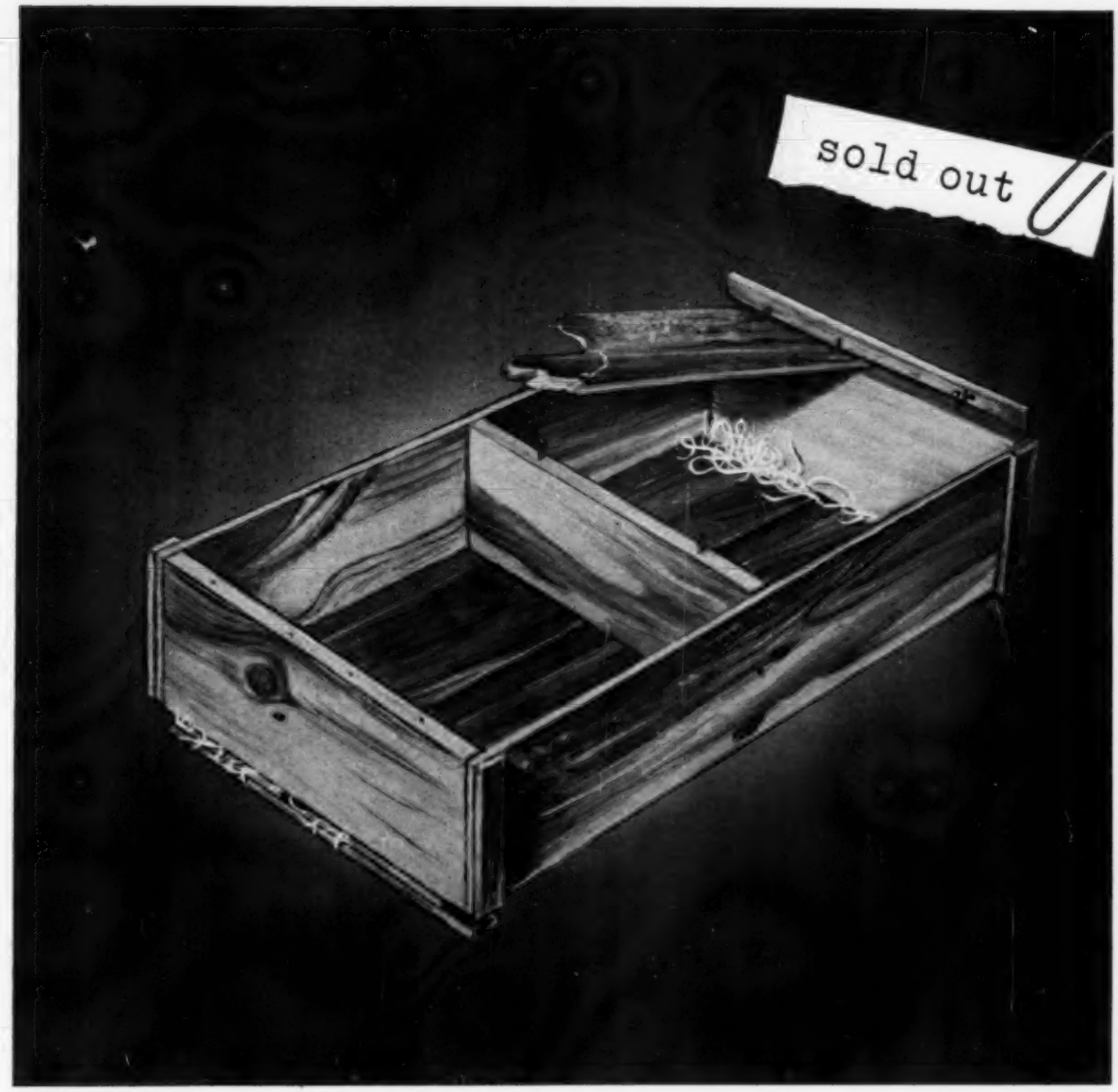
Nov. 8-10—Fertilizer Industry Round Table, Mayflower Hotel, Washington, D. C.

Nov. 12-14 — 38th Annual Convention of California Fertilizer Association, Jack Tar Hotel, San Francisco.

Nov. 27-30—Entomological Society of America, 9th Annual Meeting, McAllister Hotel, Miami, Florida.

Dec. 5-7—National Aviation Trades Association, Annual Meeting, Washington, D. C.

Dec. 11-14—Weed Society of America, Jefferson Hotel, St. Louis, Mo.



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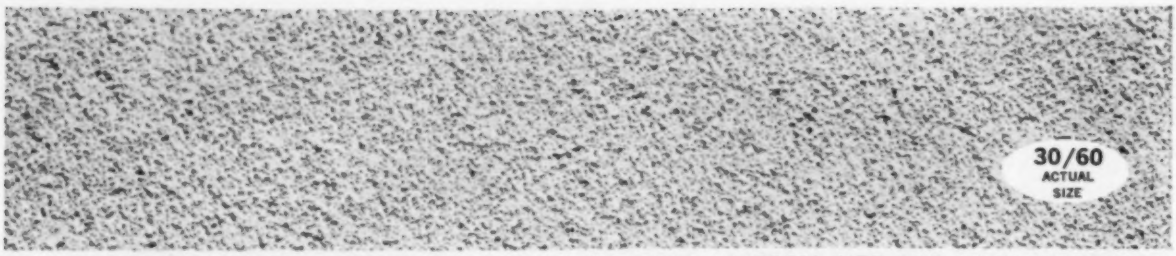
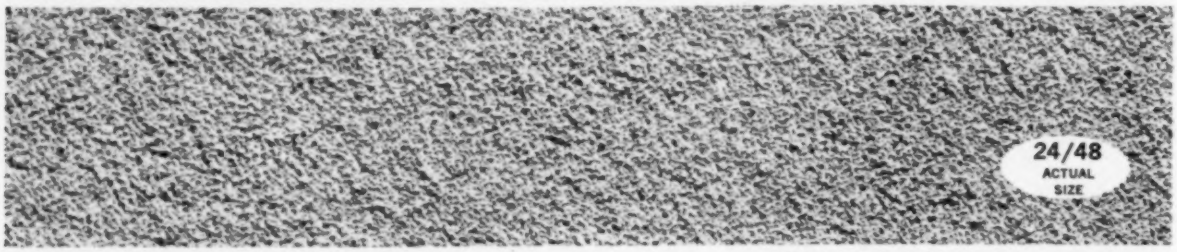


FLOREX* ATTAPULGITE CARRIERS GIVE YOU LOW DUST, UNIFORM SIZE AND HIGH SORPTIVITY



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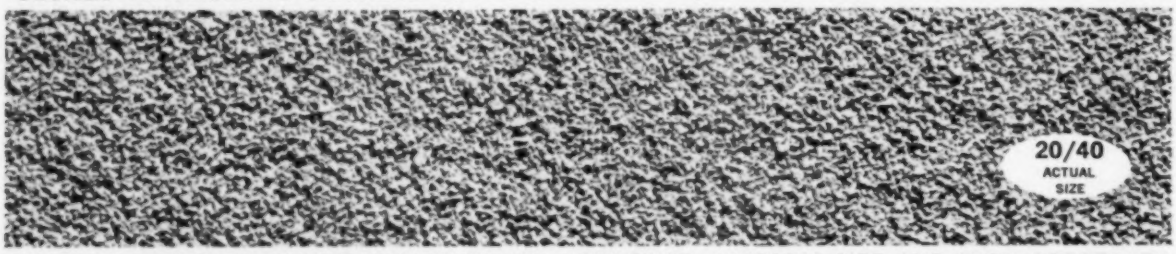

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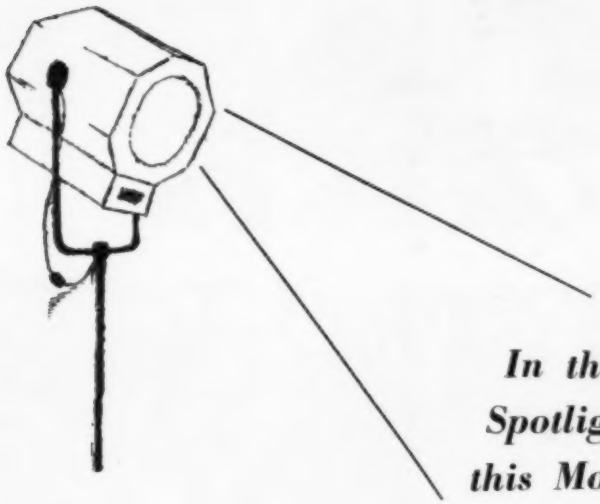

In the Spotlight this Month

- **The Farm Supply Dealer** . . . Coming to the defense of the farm supply dealer as a vital link in the chain of distribution of agricultural chemicals is a successful midwestern dealer who maintains that the manufacturer and distributor should stay out of the dealer's market. Page 14.

- **Blue Mold in Europe** . . . The introduction and subsequent rapid spread of blue mold in Europe constitutes a dramatic story with the possibility of tragic consequences for the growers who depend upon tobacco for their livelihood. Page 17.

- **Pesticide Regulation** . . . A number of states are considering or have enacted new and sometimes unreasonable regulations governing the use of pesticides. The story of one such proposal, and how it was defeated, is told by a Farm Bureau official. Page 20.

- **India** . . . A potential market for U. S. fertilizer exports, India is said not to be over-populated; rather, it is underfertilized. Page 23.

- **Cominco's Kimberley Operations** . . . The Kimberley, B. C. fertilizer plant of the Consolidated Mining and Smelting Co. of Canada Ltd., produces 70,000 tons annually of fertilizer using iron sulfide concentrate as the source of sulfur, phosphate rock from Garrison, Montana, and ammonia from Cominco's plant at Calgary, Alberta. Page 28.

- **Portable Fertilizer Bins** . . . Bulk handling of chemical fertilizer from the supplier right through to the farmer's field has been demonstrated in England. The fertilizer is transported in portable bins that can be set-up on the fields being fertilized. Page 54.

- **Group Spraying Project** . . . The use of helicopters is the key to success in an orchard spraying project made possible by a combined effort on the part of some 30 New Hampshire apple growers. Page 51.

Trade Listing

National Agricultural Chemicals Association, Association Building, 1145 19th St., N.W., Washington, D. C. Lea Hitchner, exec. sec.

National Plant Food Institute, 1700 K St., N.W., Washington, D. C. Paul Truitt, president.

American Potash Institute, 1102 16th St., N.W., Washington 6, D. C. H B. Mann, president.

American Society of Agronomy, 2702 Monroe St., Madison, Wisc. Dr. Matthias Stelly, exec. sec.

American Phytopathological Society, S. E. A. McCallan, secretary. Boyce Thompson Institute, Yonkers, N. Y.

American Chemical Society, 1155 16th St., N. W., Washington, D. C.

Association of Official Agricultural Chemists, P. O. Box 540, Benjamin Franklin Station, Washington, D. C. William Horwitz, secretary-treasurer.

Agricultural Ammonia Institute, Hotel Claridge, Room 305, Memphis, Tenn. Jack Criswell, executive vice-president.

American Society of Agricultural Engineers, F. B. Lanham, secretary, 505 Pleasant St., St. Joseph, Mo.

Carolinas-Virginia Pesticide Formulators Association, 516 S. Salisbury St., Raleigh, N. C. J. C. Whitehurst, Jr., secretary-treasurer.

California Fertilizer Association, Sidney Bierly, executive secretary, Room 213, Ochsner Building, 719 "K" Street, Sacramento, Calif.

Chemical Specialties Manufacturers Association, 50 East 41st St., New York City. Dr. H. W. Hamilton, secretary.

Entomological Society of America, 4603 Calvert Rd., College Park, Md. R. H. Nelson, secretary.

National Fertilizer Solutions Association, Room 901, Jefferson Bldg., Peoria, Ill. W. Harold Schelm, exec. sec.

National Cotton Council, P. O. Box 9905, Memphis, Tenn.

Soil Science Society of America, 2702 Monroe St., Madison, Wisc. L. G. Monthey, exec. sec.

Sulphur Institute, 1725 K St., N.W. Washington 6, D. C. Dr. Russell Coleman, president.

Weed Society of America, W. C. Shaw, secretary, Field Crops Research Branch, Beltsville, Md.

Western Agricultural Chemicals Association, Charles Barnard, executive secretary, 2466 Kenwood Ave., San Jose, Calif.

THEIR BUSINESS IS MAKING YOUR BUSINESS BETTER

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Cyanamid's phosphate business is the mining and manufacturing of the highest quality products for your mixed fertilizer requirements.

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American Cyanamid Company, Agricultural Div., N. Y. 20, N. Y.

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PHOSPHATE PRODUCTS

CYANAMID SERVES THE MAN WHO MAKES A BUSINESS OF AGRICULTURE

AG CHEM EDITORIALS

THE pesticide industry has learned from past experience to be exceedingly wary of what new hurdles may be placed in its path when a considerable number of state legislatures are in session. Law makers have a disturbing habit of responding to pressure by simply passing a new law, and one of the favorite targets over recent years has been the pesticide industry.

The legislative box score this year has not been too bad. There have been some new problems created for pesticide manufacturers, but in a great preponderance of the states where legislation has been introduced it has followed generally along the lines of previous laws with which manufacturers and users of pesticides have learned to live.

The problems have developed this year in states like Florida, South Carolina, Oregon and Washington, in all of which the legislatures have either adopted new licensing regulations, increased substantially the cost of registration under existing laws, or imposed new taxes on sale of pesticides. The end result of such controls is inevitably decreased sale of pesticides and higher costs to users. Any continuing trend in this direction will need to be watched carefully. It needs to be resisted just as strongly as we would resist increased cost and restrictions on use of medicines, life preservers, or fire extinguishers. Growers dont use pesticides because they want to, — only because they have to. This is a point our legislators should try not to forget.

One of the new pieces of legislation introduced this year that could have been most troublesome was a bill introduced in the Massachusetts State Legislature intended to set up a license-permit system to be administered by a State Control Commission. (See pgs. 20, 21) Fortunately for both pesticide users and manufacturers the bill was defeated. Its adoption would have meant that seven political appointees would have had complete authority over which chemicals could be used and which could not.

This measure was defeated this time. But, as a representative of the Farm Bureau points out, this or some similar measure will be back at the next session of the legislature. If we could only afford it, the best answer to the critics of pesticide use would be to go back — just for one season — to a typical crop year of twenty-five to thirty years ago, when every apple boasted a worm, blight regularly struck the entire tomato crop, and every ear of corn wore a corn borer.

* * * * *

IT is still too early to tell with any degree of accuracy just how poor the 1960-'61 fertilizer season actually was, although it generally is agreed that sales were off, despite last winter's glowing predictions. Excessive rains during the spring and the drought conditions in the northern plains states, added to the effects of the government's Emergency Feed Grain Program, have resulted in a reduction in sales that has been estimated at as much as eight per cent for the year.

A hoped-for increase in fertilizer sales during June materialized, but it was not large enough to offset earlier losses. One industry representative reports that sales prior to June had been 20 per cent lower than those in the previous season, with the blame divided equally between the weather and the grain program. In addition, the June increase seems to have been brought about mainly by an increase in side-dressing applications. Mixed fertilizers sales were no higher than they had been earlier.

THE AG CHEM DEALER

Local Dealers Are Vital To Effective Distribution Systems

There is need for the manufacturer, the distributor, and the dealer, if agricultural chemicals are to be distributed by the most economical method. There is much room for improvement in the recognition of, and the carrying out of, the various responsibilities throughout the industry.

The lack of defined responsibilities for the various levels of distribution is one of the main roots of the problems in the agricultural chemicals field. In many cases, manufacturers and distributors provide field service, extend credit, and make deliveries directly to the grower.

by Al Chase

Manager
Eau Claire Fruit Exchange
Eau Claire, Michigan

REPRESENTATIVES of the agricultural chemicals industry have been quoted recently as saying that the farm supply dealer is, or soon will be, out of the distribution pattern of the agricultural chemical industries. Wayne Yoder, for instance, pesticide products manager for American Cyanamid, told the Commercial Chemical Development Association (see *Agricultural Chemicals*, May, page 19) that many farmers are re-examining their traditional purchasing policies and are by-passing the dealer and, in some cases, the formulator. Farmers, he reported, are purchasing technical grades of pesticides and are doing their own formulating. Mr. Yoder sees a declining role for the dealer in the expanding pesticide market.

Another official, J. Paul Ekberg, director of marketing for Monsanto's agricultural chemicals division, said in a talk at the Spring Meeting of the Western Agricultural Chemicals Association (see *Agricultural Chemicals*, April, page 16) that "over the next ten years there will be some major changes in established channels of distribution." The basic producer, he feels, will always fill an essential role in the industry, and he sees the formulator's position as also "basically secure." He is by no means as certain about the future share in the industry of the conventional distributor, however, and predicts that he may be replaced in the future by a network of "super market" type farm supply stores.

This trend of thought is reflected in an *Agricultural Chemicals* editorial (May, page 13) which says that "The dealer has always, in our opinion, been the weak link in expanding the pesticide market. The typical busy dealer, enmeshed in the detail involved in handling a stock embracing hundreds of different items, has never had the time to really learn much about pesticides and, with but few exceptions, the basic producers have done very little to help him. If the pesticide industry is ever to approach its true potential, we agree that some major changes in the distribution pattern are an important prerequisite."

I would like it to be understood at the outset that I am not taking issue with Mr. Yoder or Mr. Ekberg personally, for the sentiments they have expressed are evident in many of the policies, or lack of policies, of a considerable number of the larger pesticide suppliers.

I do take issue, however, with the premise that the farm supply dealer is out of business. I agree that the dealer is perhaps a weak link in the distribution pattern, for he, as a whole, is lacking in the same manner as his supplier. But I challenge the industry to show me a link that *is* strong.

There is virtually no sound policy, direction, management, nor very little integrity among my suppliers—and our store works with most of the suppliers that serve our area.

For instance, the industry has been complaining for the past five years that it is not making any money. Without exception, however, I am told by sales representatives that "we will not break price, but we will meet anyone else's." Invoices say, net 30 days, but this means nothing. We pay in late fall. In addition, invoice prices can be changed by credit memos.

Suppliers assert they do not like selling directly to the grower, but they continue to do so. Why? Because their competition does. Cash discounts of 5 per cent are offered on materials where the dealer is making a gross margin of 10 per cent or so, and the supplier still maintains that he is not making any money.

I have been told several times by top-level management that the only way they can profitably sell direct is to deal only with the large growers who are not a credit risk. This is an honest statement, but is the policy really honest?

Many more circumstances could be named to further expose the situation, but most of them are well-known. Where, then, is there a *strong* link in our pesticide distribution system?

I believe that there is need for the manufacturer, the distributor, and the dealer, if agricultural chemicals are to be distributed by the most economical method. There is much room for improvement in the recognition of, and the carrying out of, the various responsibilities throughout the industry.

I believe it is the manufacturer's responsibility to carry out our research, manufacture materials, and furnish the ethical distributor with products and technical service. The distributor's responsibility is to carry a complete line and reasonable stock of agricultural chemicals from all necessary manufacturers so that he will be in position to supply his dealer with the products they require and can furnish the dealer with adequate technical service so that the dealer can be properly informed as to the correct use of these products.

If suppliers would stay out of the dealers' markets they would have time to carry out their responsibilities to help educate the dealer and his technical service men as to most effective product use.

It is the dealer's responsibility to carry a complete line of farm supplies, with sufficient inventory, including seeds, feeds, fertilizers, and pesticides. The dealer also should provide necessary service to the grower, including delivery, credit, soil testing, and recommendations. It is the dealer's responsibility to furnish the technical service and material to the farmer—not the job of the manufacturer nor the distributor.

There are two basic reasons why distributors, manufacturers, and formulators should not sell to the grower, nor give technical service to the grower. One is economic. It takes increased field personnel—already there are too many suppliers' representatives visiting our growers' farm attempting to sell a brand, rather than the proper product and service for a given situation. It is impossible for these men to be productive more than seven months out of a year—what a waste of money and talent.

These representatives can not take the time to service the average or small grower because the amount of business derived from such a grower is not sufficient to warrant the time or money spent. The sum total of business derived from this very large group of growers, however, is sufficient to affect the cost per unit of materials offered by the distributor, manufacturer, and formulator.

This group of farmers *can* be serviced by a dealer with a central location and adequate personnel, and this volume of business will not be lost. Consequenlty, the cost per unit will be kept down.

The cost to the manufacturer or formulator in credit alone would sky-rocket over the cost of credit as now handled by dealers, which already is way out of proportion to the cost of credit as compared with, let's say, the feed industry.

The second basic reason for manufacturers and formulators staying out of sale of finished products to end users is that if our suppliers would carry out their responsibilities to help educate the dealer and his technical service men as to proper product use, they would not have time for these meanderings, normally referred to as "stump-humping."

It is important to the basic manufacturer, and to the grower, that recommendations of materials be completely unbiased. This, of course, is not possible unless the recommendations are being made by people who deal with *all* available products. Then, and only then, is the point reached where the recommendation is made on a material's virtue for a specific problem under a given set of conditions. These include the grower's habits, past record of production and problems, fertility levels, plant vigor, equipment to be used, and the quality of crop the grower desires to produce. This last condition depends on the grower's market and marketing habits and many other factors that can be properly judged only by an interested local dealer

who must maintain his position in the community.

The lack of defined responsibilities for the various levels of distribution is one of the main roots of our problems in the agricultural chemicals field. In many cases, we have manufacturer and distributor providing field service, extending credit, and making deliveries directly to the grower.

This leads to much confusion, unethical distribution, and animosities among the different field representatives. All of this, in turn, tends to confuse the dealer, the grower, and, in the final analysis, the whole industry. The net result is the impeding of progress, loss of profit, and incorrect product usage.

Field men employed by the Eau Claire Fruit Exchange have but one instruction—"Do for the grower what he (the field man) believes to be best for the grower." This service can best be performed by the dealer, because he has superior knowledge of the grower and his problems.

In cooperation with the extension department of Michigan State University, our field service department conducts a series of growers' meetings each year that cover all phases of the grower's operation, even including bookkeeping and insurance problems. Last winter, we had ten such meetings, one every Wednesday night starting in January. We had an average attendance of 225 persons per meeting. Over a five year period, we have averaged about 195 persons per meeting. No commercializing is allowed at the meetings, although authorities from all phases of the industry are among the speakers.

It is not necessary to mention that these services cost money and, surely, the dealer must be compensated for them. If responsibility in the industry were more clear-cut, and carried out in a more economical manner, it would be easier for the dealer to accomplish his part, and be reimbursed properly. A responsibility of the supplier is to help the dealer maintain adequate gross margins.

That the dealer *can* carry out his responsibilities is indicated in a review of the activities of the Eau Claire Fruit Exchange since 1954.

The Eau Claire Fruit Exchange is a farm supply store, and does not handle fruit, as the name might indicate. In 1954, our current ratio was 1.22 to 1, and our stock was worth 90 cents on the dollar. Our sales were at $300,000 and we were meeting competition. We were an oldstyle co-op with about 1,200 members (a very few members had any interest in the place). The employees, as a whole, were not of a high caliber, and had little interest in their jobs. The area was saturated with direct sales to the grower by distributors and manufacturers, and farmer-dealers. Price cutting and deceptive tactics were the order of the day. Still, gross margins were between 15 and 17 per cent.

In 1955, however, gross margins slipped to about 12 per cent, which was alarming under those conditions. It was at this time that we at the Fruit Exchange decided something had to be done.

Farming is getting more technical all the time and a farmer cannot be expected to accumulate all the technical knowledge necessary for a successful operation. The dealer can furnish or direct service and information to the grower more efficiently and economically than can any other level of distribution. Certainly, the average size and small grower cannot survive without the local dealer.

With this in mind, we determined to remain in business and fulfill our responsibilities to the farmer. This meant we had to revamp our organizational structure, improve our financial position, and institute adequate service. We would have to carry larger inventory, improve our credit policies, and, in the broad but real sense, change the philosophy and opinion of virtually the whole trade area.

To do this—

We had to break with the precedents built up over 35 years of operation, and we had to buck the supply industry as a whole.

We had still to compete with other farm supply stores. (There is one about every five to nine miles in each direction).

We had to build volume and, at the same time, raise prices well above those of our competition.

We had to make capital expenditures on facilities, and increase our payroll, to attract adequate personnel throughout our organization.

Despite the high costs for all of this, and the presence of two definite factions of membership already in existence, with considerable animosity toward each other, that made the job almost impossible, we accomplished our goal. These problems have been mentioned only to point out that the situation could not have been much worse nor discouraging.

Our audit for the year 1960 showed a current ratio of 4.6 to 1, nearly a 400 per cent increase. Sales were $630,000, which is a 100 per cent increase. The stock now is worth $1.26 on the dollar, a 40 per cent increase over 1954.

We reorganized and now are a stock company. We paid off 1,075 members at 100 cents on the dollar.

(Continued on Page 77)

The dealer can furnish or direct service and information to the grower more efficiently and economically than can any other level of distribution. The small grower needs the local dealer.

First Appeared in 1958

Will Blue Mold Ruin Europe's Tobacco Industry?

Blue mold reduced yields by 65 to 70 per cent in fields in northern France and extensively damaged tobacco growing in the northern sections of Switzerland during 1960. West Germany, however, was hardest hit as losses reached nearly 70 per cent.

Figure 1.
Blue mold damage can be seen on flu-cured tobacco in West Germany.

by Paul R. Miller[1]

THE full impact of the sudden appearance of blue mold in the tobacco fields of Europe is yet to be determined, but all signs point to one major question: Will European growers organize to fight the disease, or will they let it push them out of the tobacco business?

Experience with blue mold in the United States suggests these alternatives, either total warfare or failure. In the U. S., the reasons that blue mold has caused a minimum of loss, for the past twenty years, is that it is primarily limited to seeds beds and, also, that growers, the chemical industry, and Federal and state pathologists all work together to hold the destructive fungus in check.

Europe's brief encounter with blue mold reaffirms this American experience. The disease was discovered first, in Great Britain, in 1958. This year — just three short tobacco seasons later — it poses a major threat to the tobacco industry in every Central and North European nation.

The introduction and subsequent rapid spread of blue mold in Europe constitutes a dramatic story with tragic consequences for the growers who depend upon tobacco for their livelihood.

Apparently, in 1957, the living blue mold fungus was taken from Australia for study in England. Blue mold on tobacco in Europe was first found in 1958 in greenhouses of the Plant Breeding Station in Littlehampton, Sussex. In 1959, it was found in the field in the same area of England and also in fields in the Netherlands, Belgium, and West Germany.

The first 1960 report of blue mold in Europe came on June 21 from near Karlsruhe, a city in the southern part of West Germany. In the days and weeks that followed, the disease was reported occurring in France, Belgium, Holland, East Germany, Switzerland, Czechoslavakia, Austria, Italy, Yugoslavia, Hungary, and Poland.

The cost of this first onslaught: More than $50 million. Furney A. Todd, a North Carolina State College plant pathologist who observed the outbreak first hand, reports that blue mold reduced yields by 65 to 70 percent in fields in Northern France and extensively damaged tobacco growing in the northern sections of Switzerland[2]. But West Germany was perhaps hardest hit. (Figure 1). Here, growers plant about 16,500 acres of three types of tobacco — burley, cigar, and flue-cured — in three different sections of their country. Without exception, all types in all areas were severely damaged by blue mold. Losses of burley were nearly 70 percent, half of the cigar tobacco crop was lost, and flue-cured tobacco yields were reduced by 40 to 50 percent.

[1]Plant Pathologist, Crops Research Division, Agricultural Research Service, United States Department of Agriculture, Beltsville, Maryland.

[2]Todd, Furney A., 1961. The Occurrence of Blue Mold on Tobacco in West Germany, Switzerland, France and other European Countries. Plant Disease Reptr. 45: 319-326.

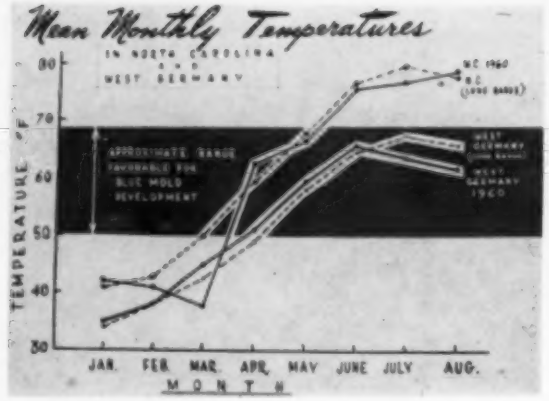


Figure 2.

A comparison of the mean monthly temperatures of North Carolina and West Germany shows the ideal nature of the latter's weather for blue mold. This is typical, also, of at least 8 other European nations.

The disease took a further toll of harvested tobacco, according to Mr. Todd. Tissue of many harvested leaves was partially molded. Other, apparently healthy leaves, developed mold during curing. Burley tobacco sampled from two curing barns by Mr. Todd typically displayed about 70 percent of the leaf area darkened and damaged by blue mold lesions. Seemingly healthy cigar tobacco developed disease symptoms over as much as 40 percent of the leaf surface during barn-curing.

What's in store for this year? Certainly the disease will be widespread. American growers recognize blue mold as having the potential of an explosive for destructiveness. Given the right environment, it multiplies with the speed of a chain reaction. Its spores are spread effectively over long distance by wind. Only three years ago the blue mold organism was contained — so far as anyone knows — in an English greenhouse. Last year, the disease caused devastating loss in several European nations, despite a late start. This year it has jumped across the Mediterranean Sea to infect tobacco seed beds in Tunisia and Algeria — the first time this disease has appeared on the African continent.

Environment appears to be in its favor, too, Mr. Todd says. (Figure 2). There is no question about the ideal nature of West Germany's weather for blue mold — mild temperatures, high relative humidity, and frequently cloudy skies. There is evidence that such weather is typical also in some tobacco growing areas in at least eight other European nations, including Austria, Poland, and Romania.

Still another question concerns the potential of this disease for destroying young seedlings in tobacco plant beds of Europe. Because there was no general reservoir of the blue mold fungus, the disease did not occur in seedbeds in Europe in 1960.

However, this spring we have received reports of the occurrence of blue mold in tobacco seed beds in Italy, Algiers, Tunisia, Southern France, Germany, Czechoslovakia, Hungary, Albania, and Greece.

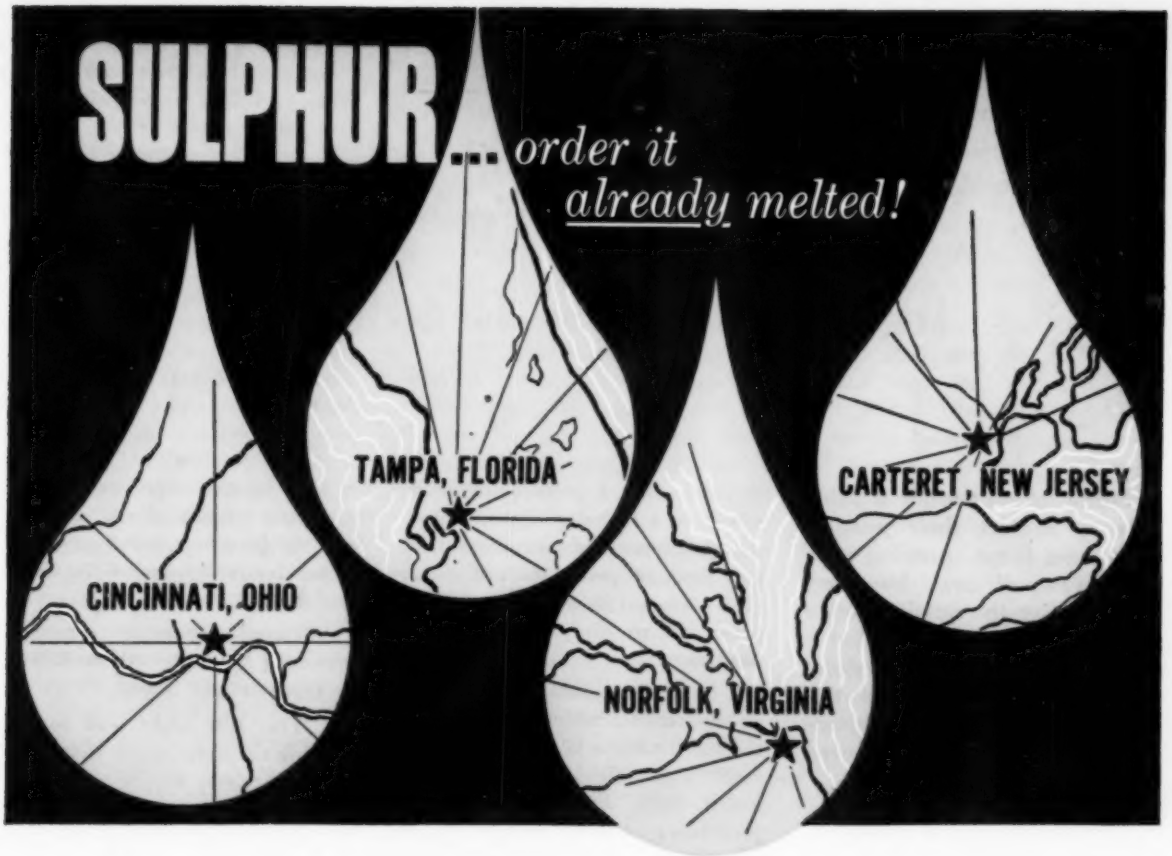
The plant beds are where American growers wage their biggest fight against the fungus. Uncontrolled, infection can wipe out a plant bed in a mattter of a few days. Because of the better establishment of the disease throughout the European tobacco growing areas, this plant bed infection could have a devastating influence on this year's crop.

Many American plant pathologists believe that their tobacco-growing neighbors across the Atlantic face a hard and costly fight, if they really intend to control blue mold. Control will have to begin in the plant bed and continue through harvest. It will mean chemical or heat sterilization of plant bed soils and the use of fungicides in both plant beds and fields. It will mean changes in tobacco culture — crop residue destruction to limit overwintering sources of the fungus, fertilizing to offset the impact of the disease, particularly in plant beds, and wider spacing of plants in the fields to enable lower leaves to dry free of dew each day and so not be such an easy target for disease attack.

Such control will be expensive. The cost is estimated at $50 to $100 an acre, exclusive of labor. It will require active participation by almost every grower in Europe, if disease intensity is to be kept at a controllable level. In the final analysis, blue mold control may depend on the effectiveness of the European and Mediterranean Plant Protection Organisation Reporting Service. In the United States, a weekly forecasting service carried on by the U. S. Department of Agriculture, in cooperation with State Agricultural Experiment Stations, aids in effective blue mold control. This warning service tells growers and industry alike what can be expected in terms of time-of-outbreak and disease intensity. It enables dealers to be adequately stocked with fungicide and other necessary chemical weapons. And it enables growers to spray or dust their plantings in time to protect against blue mold, without waste.

Can a half dozen or more independent nations handle these problems? European growers may be supplying the answer right now? Indications are that the 1961 tobacco acreage will be 15 to 20 percent below 1960. Another bad blue mold outbreak this year, which currently seems inevitable, could well determine whether European growers are going to fight back or give in to the disease.

The magnitude of this plant disease problem, perhaps unequalled since the potato late blight epidemic in Europe over a hundred years ago, presents a real challenge to the plant pathologists of Europe and, at the same time, an opportunity to the manufacturers of fungicides of both Europe and the United States.★★



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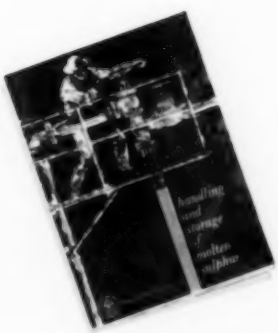

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Dangers Are Foreseen In Pesticide-Use Regulations

Many farmers want legislation to protect their pasture land from large spraying projects. Few, if any, however, want to give the administrative arm of the executive government a blank check to legislate, prosecute, and judge. Yet, this has been proposed in Massachusetts, and will be proposed again.

by Carleton I. Pickett
Executive Secretary
Massachusetts Farm Bureau Federation

THE administrative bodies of the state of Massachusetts which are concerned with use of agricultural chemicals apparently intend to force thru the State Legislature some form of license-permit system to be administered by a State Control Commission. (*see Agricultural Chemicals*, July, Pg. 40)

Back in 1959, a mass meeting was called in the Science Park Halls in Cambridge by the exceedingly-persuasive commissioner of natural resources. It was a sounding board for the alarmists who just *knew* that agricultural chemicals were poisoning the birds, the bees, the fishes in the brook, and people.

At that open session of oratory and flights of fancy, it was my privilege to state, very forcefully, my personal belief, which has never changed,—that a political decision would be a bad decision and that the judgments of manufacturers and users of pesticides and those who advise on their use were to be preferred to the judgments of bureaucracy.

Came the cranberry scare, and its aftermath, which brought to the forefront the head of our Food and Drug Division. There followed milk contamination and poultry capettes.

The Farm Bureau delegates decided that control was coming and that we should be "for" that which was least obnoxious.

Some governmental agencies *do* spray pasture land or corn fodder and many farmers *want* legislative protection. Few, if any, however, want to give the administrative arm of the Executive Branch a blank check to legislate, prosecute, and judge. Yet, this was proposed in Massachusetts, and will be proposed again in 1962.

On May 9, 1961, the Special Commission established to make an investigation of the use of Pesticides reported to the Legislature.

On May 11, I gave every legislator the following letter:

"The Report of the Recess Commission on Insecticides will be before you this week with a Bill.

"We ask you to give this Bill 'Next Annual Session.' (Polite term meaning, 'Kill the Bill.' Ed.)

"The Commission's report is misleading. 'Public hearings' were *not* held by the impressive list of State-wide organizations. In our case, the president and I sat down for two hours with one of the Commissioners.

"These State-wide organizations have not endorsed the Bill as the report might imply.

"This Bill could lead to the granting of more power than ever has been given to the Executive Branch.

"This could hamper progress in any change-over from chemicals to biological deterrents.

"The use of pesticides, including the whole wide range of insecticides, fungicides, rodenticides, herbicides, defoliants, desiccants or any chemical that you can spray or dust, is covered in a blank check. This Bill is being called just an Enabling Act. It's all of that.

"This proposed legislation would enable seven departmental heads to do anything that they want to do concerning the use of pesticides. This is a complete delegation by the legislature, to these seven departmental heads, of police power never yet defined or used in this Commonwealth.

"This proposal says, to seven politically-appointed men or their designees; 'you go ahead and decide what may be done in the field of pesticide use.' This enables seven men to license farmers or anyone else who uses pesticides, fungicides, etc., etc.

"This legislation enables seven men to decide which chemicals may be used and which may not.

"This proposal enables seven men to decide which brand may be used and which may not.

"This proposal enables seven men to legislate, regulate, enforce, and prosecute.

"These things may be done to the exclusion of private interest in the name of public interest and we are about to be asked to trust these men. We, in Farm Bureau, maintain it is not a question of trust, personalities do not enter into it. We believe that the Legislature is the proper body to legislate.

"We do appreciate the attempt of the Commissioner of Agriculture to exempt farmers, but we do not *want* a Bill that must exempt us. While we can not wait for a board or commission to give us a permit, we can do better than ask exemption. We ask no legislation until there is a concrete proposal worthy of our support."

I am on the record as saying that my organization was ignored, circumvented, and told we could not win. With the help of our friends, we killed the Bill in the House 177 to 66. In the Senate there were not enough Senators for the Bill to gain a count of the yeas and nays.

But the Legislature continued the Study Commission with instructions to report January 24, 1962. We have it to do all over again.

Farmers Deeply Concerned

Farm men and women and young people are not so pre-occupied with farming that they are unaware of the ramifications of pesticide usage. They are deeply concerned about birds and wildlife, fish and game, our trees along the highways, our forests, and our food and flowers. American farmers yield to no group in their facilities for understanding these things and the need to protect and conserve. They also remember what a new generation does not remember—the clouds of mosquitoes that made life out-of-doors unbearable at times, the dense quantities of house flies, and, as they walked down the sidewalks under the maples, the caterpillars that dropped to the ground or down one's neck.

Many of those most vociferous in their demand for pesticide regulations are from a new generation that seldom sees a twisted, scabby apple, or one with a worm in it, and, therefore, can get excited over misinformation and will not take the time to wait for facts.

A new generation which seldom sees a twisted, scabby apple, or one with a worm in it, can get excited over misinformation and not wait for facts.

The statement was made on the floor of the Massachusetts Legislature, that if the proposed Bill had been in effect, the cranberry scare would never have happened. This is an example of ignorance of facts. This Bill would stand alone amongst all the States of America as the one example of Bureaucracy Unlimited and leave all of the rest of America untouched by it. The cranberry incident was a West Coast violation, coupled with a bureaucratic example of the unwisdom of some administrative people.

In Massachusetts, the Recess Study Commission undoubtedly believes sincerely in what it advocates — complete administrative authority over the whole field of usage of pesticides, insecticides, herbicides, rodenticides, defoliants, desiccants, toxic or non-toxic, hazardous or non-hazardous, in existence today or to be discovered in the future.

They can point, with some truth, to dangers in "piece-meal" specific legislation as made by legislators. They see no wrong in administrative branches of the Executive being delegated by the Legislature to legislate and many legislators no longer see any dangers in such procedure.

So, we have to recognize first of all that government departmental heads believe we should trust them. They have relegated to ancient history the basic political theory of American Government that sets up a system which protects the citizens from arbitrary government.

Since all of us may come up against the pesticide problem next year in the Legislature, we have to understand the system of bureaucracy. My use of the word is deliberate and not derogatory. It exists to serve or to be master, according to aroused public opinion or the lack of it.

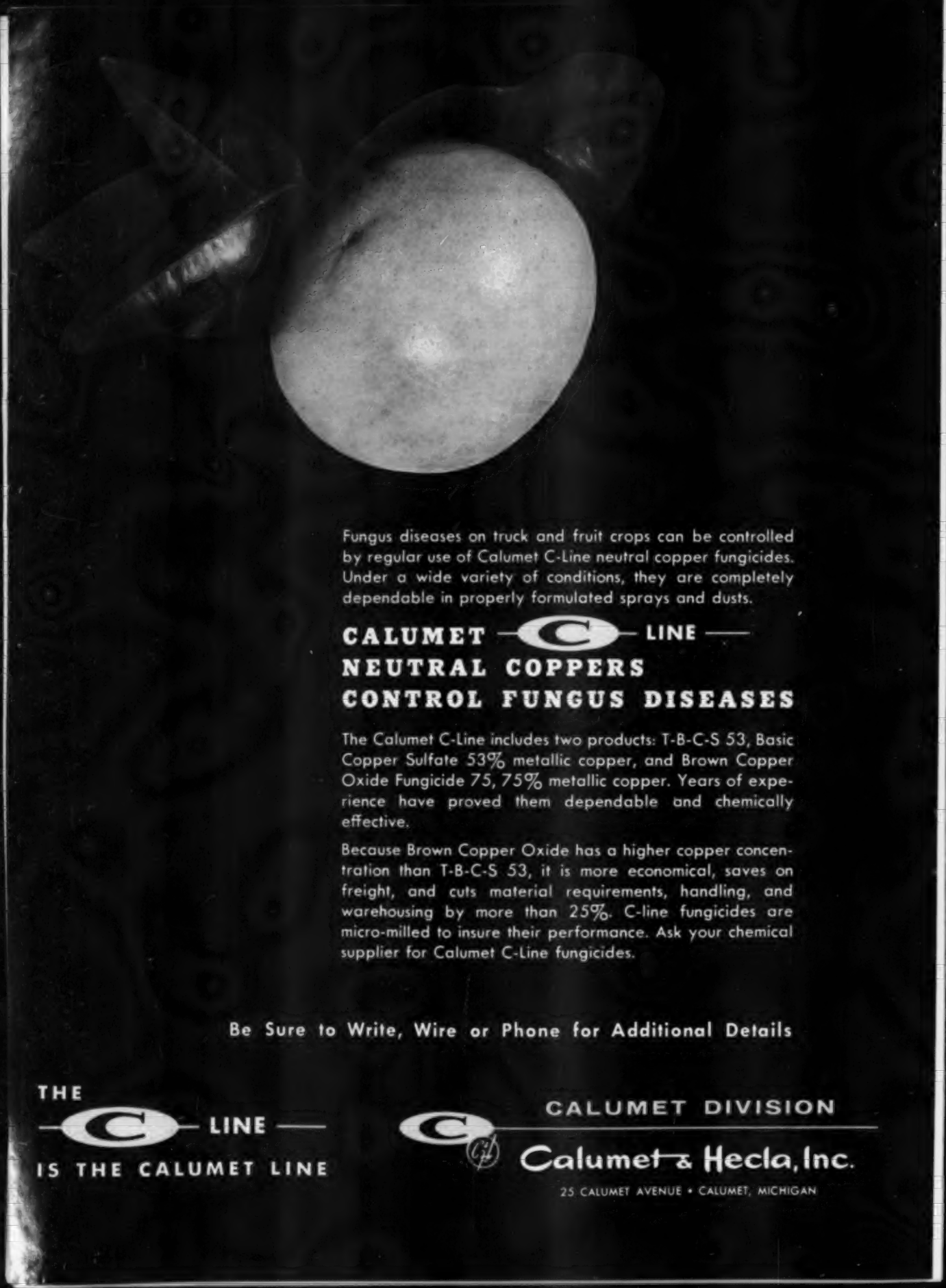
One point that must be understood is the lobbying power of the bureaucracy, its methods, and its determination to sooner or later get exactly what it wants.

Lobbying is far better understood and practiced by Government than by registered lobbyists. They understand that it is necessary to persuade citizen groups by meetings, newspaper editorials, and all other media which they woo assiduously, and on government time, as part of their job of "education." Their legislative secretaries are not subject to "lobby" rules and may and do carry pressure rather far.

Another point of importance is that bureaucracy honestly believes it represents social and economic groups and has persuaded some legislators that it does.

Each of the department heads which form the Study Commission on pesticides likes to think of himself as a spokesman for the particular social or economic group with which he comes most in con-

(*Continued on Page* 75)



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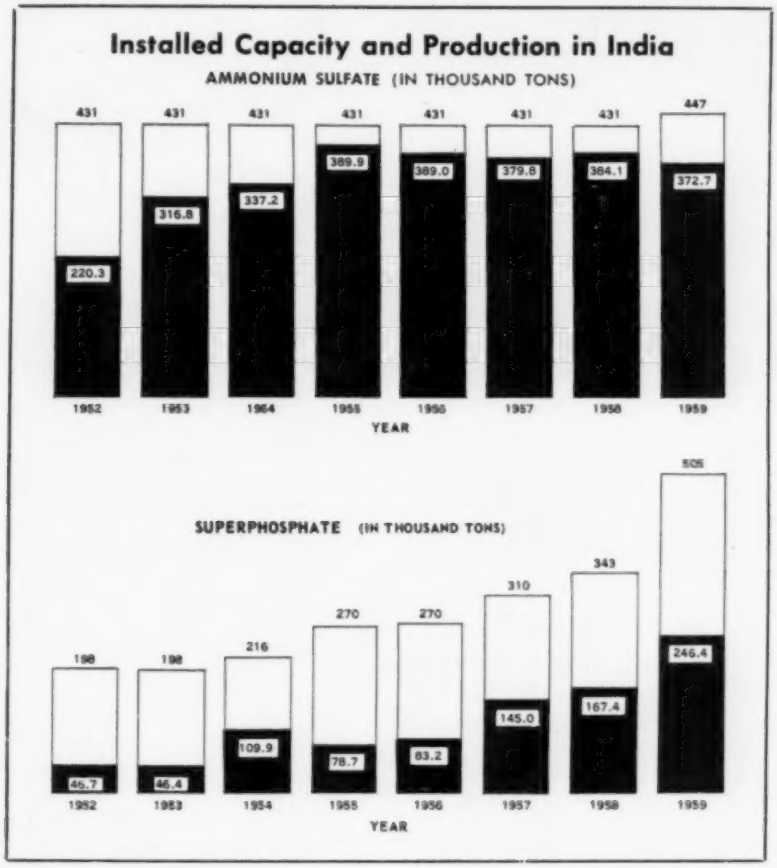


India is Potential Market For U.S. Fertilizer Exports

India should be using 10 million tons of total plant food annually—a figure that represents half of the total U. S. production. With this, India could at least double, and, in many cases, triple its present yields. 40 per cent of India's land area is devoted to agriculture, compared with a mere 13 per cent in Japan.

INDIA, the cause of much concern among the world's scientists because of the current population explosion, is in far better shape than many other countries to weather its ravages. According to Dr. Vincent Sauchelli, "India is not over-populated; it is under-fertilized."

Dr. Sauchelli should know. One of the world's leading agronomists, he serves as chemical technologist for the National Plant Food Institute. He is the founder of the fertilizer industry's Round Table, which he has watched grow from a membership of 7 people to more than 500. He currently is the Chairman of its Executive Committee. He also is the editor of one of the authoritative texts in his field, *The Chemistry and Technology of Fertilizers.*

Dr. Sauchelli recently returned* from a five months' tour of India. He was there as a consultant to Phoscheme of India, the educational arm of India Phosphate Fertilizers, Ltd., which is, in turn, an affiliate of International Ore and Fertilizer Corporation (Interore), New York. 50% of the cost of Phoscheme of India is borne by the triple super phosphate producers of the U. S. Dr. Sauchelli received the full co-operation of top officials of the Indian government in his primary task of evaluating the fertilizer requirements of the nation — both immediate and long range.

The Indian government, according to Dr. Sauchelli, is well aware of its problems, as well as the role that fertilization can play in the solution of some of the most pressing. He cites as one of the problems a custom probably as old as India's civilization. There are 200 million head of cattle in India. But the droppings are never used as fertilizer. In a country rich with unmined coal deposits, they are dried and used as fuel.

On the other hand, the government is bent on increasing the use of fertilizers. Its program, with a target date of 1966, calls for the consumption of one million tons of nitrogen, 500 thousand tons of phosphates and 200 thousand tons of potash. India now produces approximately 70 million tons of food grains; its 1966 goal calls for a 50% increase — the production of 105 million tons. To bring the benefits of increased utilization of fertilizers to its farmers, India employs some 36,000 persons in its extension service, with agricultural development stations located at strategic points around the country.

The need for fertilizers in India is staggering. Of the more than 65 million farmers, about 50 million own farms averaging three to five acres. Comparisons with

(*Continued on Page* 75)

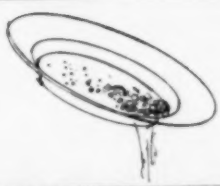
* *Agricultural Chemicals*, July, 1960, Pg.-79 and April, 1961, Pg.-14.

Dealer Training Services Exclusively for Fertilizer Selling

NOW — Full Orbit embraces an entirely new and bigger area of customer service. This service is specifically designed to help you increase your sales through your dealers. It includes not only assistance for your own salesmen but assistance for your dealers' salesmen. Ask your IMC representative to show these services the next time he calls.

NEW! Dealer Training Meeting Package — This is a detailed description of how to conduct a successful dealer training meeting. It provides step-by-step information on proven sales techniques and offers favorable management assistance to the dealer. A strip film and scripts are specifically tailored to more profitable sales.

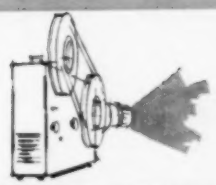
NEW! Sul-Po-Mag Flash Cards — An excellent pocket-size item which your dealers may use as a reminder of Sul-Po-Mag's unique advantages. A set of 20 cards gives your dealers' salesmen the entire Sul-Po-Mag story in a convenient manner.



NEW! Prospecting Procedures — Systematic procedures for analyzing your fertilizer market, securing new prospects, and then developing these prospects into new customers.

Let's Makes Sales Today — A detailed procedure for increasing fertilizer sales now. It includes telephone selling technique, using credit as a sales tool, and interview-canvassing procedure that practicaliy guarantees successful results.

NEW! Maximum Yield Forms — A powerful but easily worked tabulation which your salesmen may use with your dealers to determine profit potential in the dealer's marketing area. It dramatically illustrates the maximum benefits offered the farmer.



NEW! Training Film List — Contains a listing of important films compiled from the library of IMC, U.S. Department of Agriculture and the National Plant Food Institute. Each of these films has been selected for its pertinence to the sales problem.

Farmer-Dealer Meeting Kit — The proven practical, planned way for holding successful farmer-dealer meeting. Step-by-step description includes programming, location, notification, equipment requirements, product information, group participation techniques, and other important subjects.

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More NPFI Meeting Pictures

1. Miss Susan Parker, St. Petersburg, Fla., granddaughter of Victor Ericson, Consolidated Rendering Co.; and Michael Sackett, son of Walter Sackett Sr., A. J. Sackett & Sons.

2. Mr. & Mrs. B. W. Smith, Agrovita Inc.; and Dick Bond, Stauffer Chemical Co.

3. Rep. Harold D. Cooley, South Carolina, and A. Rahimtula, Interore, India.

4. John Hall, Potash Co. of America; V. Sauchelli, NPFI; R. E. McAllister, Consolidated Mining & Smelting Co. of Canada; and Al Spillman, Fertilizer Manufacturing Cooperative.

5. L. Kaniecki and J. Murray of Tennessee Corp.; L. C. Oakley Jr. and R. R. Burns, U. S. Phosphoric Products.

6. J. E. Streetman, Ralston Purina Co., and Paul Truitt, NPFI.

7. S. K. Patil, Minister for Agriculture of India, and H. S. Ten Eyck, International Ore & Fertilizer Co.

8. W. M. Fifield, U. of Florida, and W. H. Garman, NPFI.

9. W. J. F. Francis, American Potash & Chemical Corp.; Mr. and Mrs. A. Claudot, Societe Commerciale de Potasses d'Alsace, Paris; Mrs. Francis; G. D. Glover, French Potash & Import Co.; and Mrs. Frank McGrane, American Potash.

10. W. Orr, St. Regis Paper Co.; J. F. Crissey, GLF; and King Ludington, Chase Bag Co.

Another page of pictures and the complete story of the meeting starts on page 14 of the July issue of "Agricultural Chemicals."

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In closing the Chief says "How". Which means: if there's any way the Pee-Cee-A scout in your territory can be of service to you, send him a smoke signal and tell him "How".

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Originally designed to produce only 11-48-0 fertilizer, the Kimberley plant of Cominco began production of 16-48-0 in 1959, and, at the present time, both are produced in about equal quantity, averaging about 35,000 tons per year of each type. The Kimberley plant is rated at 200 tons per day of production and makes Cominco one of the leaders in North America's fertilizer industry

THE Consolidated Mining and Smelting Company of Canada, Ltd., holds an impressive position in the industrial world. One of the world's largest base metal producers, Cominco also produces a substantial amount of chemical fertilizers and is one of the leaders in North America's fertilizer industry.

Cominco produces daily 1,000 tons of refined metals, principally lead and zinc, and 1,800 tons of high analysis chemical fertilizers covering a wide range of plant food ratios. Its major operations are centered at the cities of Trail and Kimberley in the Kootenay district of southeastern British Columbia and at Calgary, Alberta. Kimberley is the site of the great Sullivan Mine, the company's main source of lead-zinc ore. The lead and zinc concentrates are shipped to Trail for smelting and refining, and a portion of the iron concentrate is used at Cominco's Kimberley fertilizer operations in the production of ammonium phosphate fertilizers.

One complete fertilizer unit at Kimberley is used to make two different grades of ammonium phosphate fertilizer. Originally, the plant was designed to produce only 11-48-0. In 1959, production of 16-48-0 fertilizer began and, at the present time, 11-48-0 and 16-48-0 are produced in about equal quantity, averaging about 35,000 tons per year of each type. The plant is rated at 200 tons per day of production.

Briefly, as shown in the accompanying flowsheet, gaseous ammonia reacts with prepared phosphoric acid in reaction agitators, forming a slurry that is mixed with circulating undersize fertilizer in a blunger. The resulting wet mix is dried in a rotary drier, and screened to recover the finished product size which is sent to bulk storage.

Reaction System

The prepared phosphoric acid is drawn off the recycle pump line from the acid feed tank A kidney valve is used to control drawoff rate manually. The acid flows through a magnetic flowmeter with recorder, then discharges into the top of the first of three series agitators, arranged so that fertilizer slurry can flow by gravity from tank to truck. Each agitator is a stainless steel tank lined with acid proof brick. The tanks are 11-feet in diameter and 12-feet deep. Gaseous ammonia is introduced tangentially through the side of the first and second agitators near the bottom through a single three-inch open-end stainless steel pipe. The pipes extend about six inches into the slurry.

One three-inch open-end ammonia pipe is provided in the third agitator, extending vertically into the slurry, but it is used only to adjust pH when switching from 11-48-0 to 16-48-0. An ammonia header supplies each agitator pipe through an individual control valve, manually operated. Steam and water connections are affixed to each agitator feed pipe downstream of the control valve and are used to prevent plug-ups during down periods.

The reaction system is designed to operate with about 80 per cent of the ammoniation being done in the first agitator, and the remainder in the second. The third agitator is used to control the desired pH for each product. The 11-48-0 slurry is controlled at about pH 3.8, through the use of a brom cresol green indicator. The 16-48-0 slurry is controlled at pH 7.0 with a pH meter and hand samples of dilute slurry.

The two products are ammonium phosphates, with a small quantity of ammonium sulphate for $N:P_2O_5$ ratio control. The 11-48-0 is considered to be a mono ammonium phosphate, formed according to the reaction

$$NH_3 + H_3PO_4 \rightarrow NH_4H_2PO_4.$$

This report is taken from a paper presented by H. A. Howard and W. J. D. Broster, fertilizer department, The Consolidated Mining and Smelting Co. of Canada Ltd., Kimberley, B. C., at the American Chemical Society's 138th national meeting in New York, Sept. 11-16, 1960.

Sulfuric acid reacts to form ammonium sulfate

$2NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$

16-48-0 is a mixture of mono and di-ammonium phosphates, and requires the additional reaction

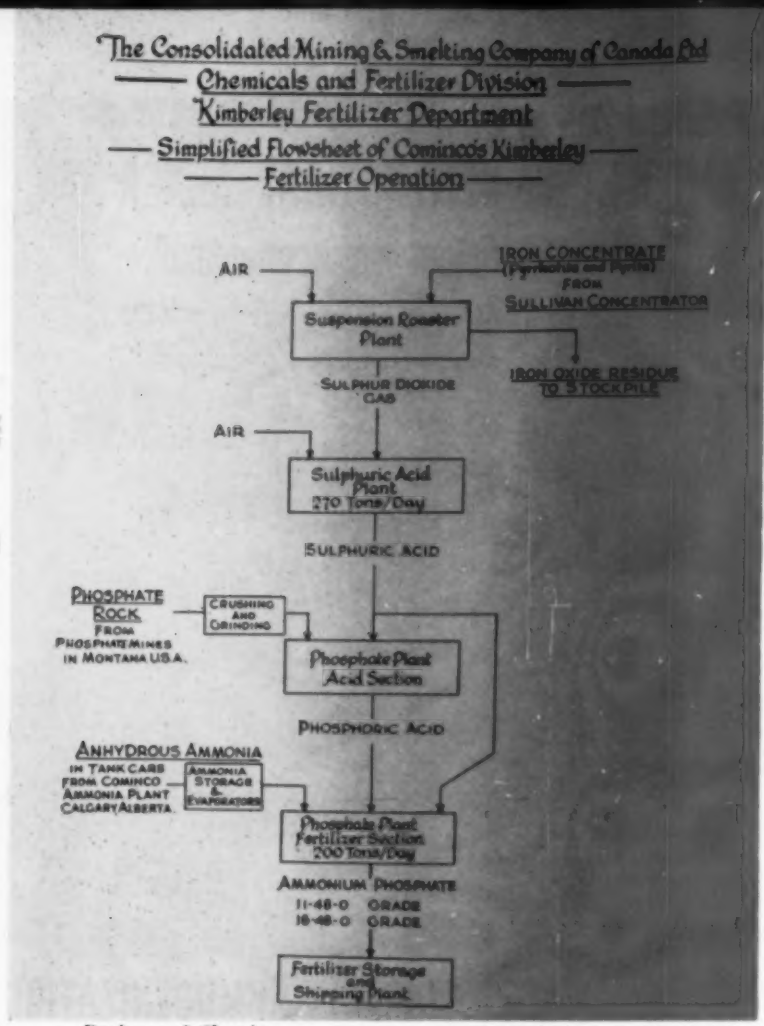
$2NH_3 + H_3PO_4 \rightarrow (NH)_2HPO_4$.

The above reactions are exothermic, and temperature control is effected by water evaporation from the slurry. The large volumes of steam formed are drawn off through ventilation ducts for scrubbing in two Doyle impingement scrubbers in parallel, using either sulfuric or phosphoric acid solution to recover any ammonia evolved from the reaction system. One fan on each scrubber provides the suction required for adequate ventilation. A total of 8,000 to 12,000 cfm of gases is handled in this system.

Granulation

To convert the hot slurry to finished granules, slurry coating of fine fertilizer particles is used to build up the size of fine granules. A Dorr 5' x 12' blunger is used to mix the circulating fines and slurry. The rate of build-up of granules is controlled by adjustment of ratio of dry fines to slurry added to the blunger so that the blunger discharge mix has the proper moisture content. The fine fertilizer is obtained as undersize or pulverized oversize from the screening operation, and as recovered fines from dryer gases and clean-up of product at the storage plant. A holding bin, capacity about 10 tons, is located above the feed end of the blunger and a controlled flow of fines discharges through a bottom chute to the blunger. Slurry flows by launder from the surge agitator to the blunger.

Because two products must be produced in one unit, a separate storage bin, about ten tons capacity, is provided to hold the fines of one product while the other is being produced. The fines are interchanged when the type of fertilizer product is changed.



Drying and Cleaning

Wet mix drops from the blunger into a concurrent dryer, 104 inches in diameter and 60 feet long. Pulverized coal is used as fuel to maintain drier discharge gas temperature at 105°C for 11-48-0 and 90 to 95°C for 16-48-0. Lifters are provided to cascade the material in the drier, and to carry it to the discharge.

A fan draws about 25,000 cfm of gases out of the drier, through a set of four cyclones. The recovered dust is collected in a small bin feeding a dust pump, and is pumped into the fines bin. Leaving the fan, the gases enter a system of Doyle impingement scrubbers for recovery of most of the remaining fertilizer dust. Four separate impingement boxes are installed, two sets in parallel, each set composed of a recovery scrubber followed in series by an abatement scrubber. The recovery scrubber uses as a scrubbing medium either weak sulfuric acid solution that overflows from the fertilizer agitator scrubber (about 5 gpm), or a small flow of fourth filtrate from the phosphoric acid section. The overflow drains by gravity to the evaporator circuit. A pump is installed to recirculate the scrubber solution to prevent settling of solids in the scrubber box. The abatement scrubber is provided to remove any remaining particulate matter before discharging the gases to atmosphere. Water is used as scrubbing medium, and a flow of 25 to 30 gpm passes through each box before draining to sewer. Suction for scrubber operation is provided by one fan for each parallel set. Clean gases pass to atmosphere through a common stack.

Circulating System

Fertilizer drops from the dryer into a transverse screw, then into a screw feeding the boot of a bucket elevator. The elevator discharge provides facility for feeding any or all of three sets of double deck Hummer screens. Screening separates +6 mesh (Tyler scale) as oversize, −6 + 20 mesh as finished product, and −20 mesh as undersize.

Oversize drops into a hammer mill located above the fines screw which handles the pulverized material. Undersize drops from each screen unit into the fines screw, then enters a bucket elevator that discharges into the fines bin.

Phosphoric Acid

The phosphoric acid section of the Kimberley plant is patterned on the original Dorr west process phosphoric acid plant, with some modification. Briefly, dry fine rock and sulfuric acid are reacted in a series of agitators or digestors to produce phosphoric acid and gypsum. Filters are provided to separate the phosphoric acid from the gypsum. Phosphoric acid is sent forward for evaporation prior to use in the fertilizer section, and gypsum, after thorough washing to recover most of the free phosphoric acid, is pumped to impounding ponds.

Rock treatment rate averages 325 tons per day. To assure efficient P_2O_5 removal at the filters, a system of operation has been developed in which a so-called single rock rate (about 240 tons per day) is held for two shifts, about 15 hours, so that by scheduled switching of filters, all filters receive a water wash. For the remaining nine hours, a double rock rate is used during which all filters are in service.

Bulk Storage

A pneumatic belt conveyor discharges the finished product into a 5-feet diameter receiver located high above the bin of the storage plant, which is designed to separate the fertilizer from the transport air. Transport air, carry-

(*Continued on Page 76*)

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SULFUR

In Plants And Soils

It is conceivable that as much attention soon will have to be given to the problem of supplying adequate amounts of sulfur to the soil for plant-nutrient purposes as now is being given to preventing a lack of nitrogen, phosphorus, and potassium from being limiting factors in crop production.

IN an inventory and balance sheet of plant nutrients for the United States during 1930, it was estimated that losses of sulfur from the soil in the sale of harvested crops and of livestock and its products, and by erosion and drainage, amounted to 12,043,000 tons annually, and that additions by way of fertilizers, manures, liming materials, rainfall, irrigation water, and seeds amounted to 9,029,000 tons annually, resulting in a net national loss of 3,014,000 tons of sulfur per year.

The corresponding values for phosphorus were 4,221,000, 1,448,000, and 2,773,000 tons respectively. The total sulfur content of the plow depth of the soils of the crop and pasture lands was estimated at 378,126,000 tons, in comparison with 648,897,000 tons of phosphorus.

A later and more specific attempt at estimating the input and outgo of sulfur from the soil was made in Indiana in 1950. The quantity of sulfur brought down as SO_2 in precipitation was found to range between 20 and 127 pounds per acre annually at various points about the state, the highest value being found near the cities and the lowest out in the open country, far removed from industry. The average contribution of sulfur in precipitation for the state was estimated at 27 pounds per acre. The total average input of sulfur, estimated at 67 pounds per acre annually, was made up of 27 pounds in precipitation, 27 pounds directly absorbed by the soil as SO_2 from the atmosphere, 12 pounds returned in crop residues, manures, and fertilizers, and one pound absorbed directly from the atmosphere as SO_2 by plant leaves. The outgo of sulfur, estimated at 60 pounds per acre annually, was made up of 17 pounds in the harvested crop (3 tons of alfalfa hay), 37 pounds in the drainage water, and six pounds by surface erosion. Thus, the average input appeared to be seven pounds greater than the outgo.

Averages such as these, however, are of little significance in estimating present need for sulfur as a supplemental plant-nutrient element to be applied to the soil. The contributions obtained from the atmosphere are much lower in some areas than the average. Acre yields of crops have been stepped-up to considerably higher levels in many areas since the date of these studies. And, concepts about acre-yield potentialities of crops have been greatly advanced during recent years, because of the excellent results that have been obtained from the use of much larger applications of fertilizers, particularly those supplying nitrogen. Furthermore, economy of production of crops demands increased concentration of fertilizers to reduce freight and handling charges. Such concentration is most largely effected by the elimination of sulfates from fertilizer materials and the mixtures that are made from them.

The average SO_3 content of all mixtures of fertilizer materials sold in the United States in 1948 has been estimated at 19 per cent. This included not only the SO_3 in ammonium sulfate and superphosphate, but that contained in any potassium sulfate that may have been used as a source of potash as well. In recent years, many mixed fertilizers are made to contain magnesium and a number of trace elements, many of which also are supplied in the sulfate form.

The total quantity of SO_3 applied to the soils of the United States in fertilizer form was estimated at 1,313,000 tons in 1900, 2,408,000 tons in 1925, and 4,700,000 tons in 1948. At the last mentioned date, over three fourths of the mixed fertilizers contained more SO_3 than the sum of their N, P_2O_5, and K_2O. In addition, even larger amounts of SO_2 were being brought down in rain and were being absorbed from the atmosphere by soils and plants, notably in areas of increasing indus-

trial activity. It is not surprising, therefore, that relatively little attention was being given to the possibility that crop yields might be limited by a lack of sufficient sulfur to meet plant needs.

Sulfur Deficiencies

The importance of sulfur as a nutrient, not only for plants but for animals and man as well, is such that its value for this purpose was never lost sight of. From time to time new studies were undertaken to determine the functions of sulfur in living things and to re-evaluate the outgo of this element from soils in relation to its need for the production of feeds and foods. Among the many interesting studies along this line are some that were designed to obtain a better knowledge of the symptoms of sulfur-deficiency in plants.

Studies conducted at the New Jersey Agricultural Experiment Station indicate that a deficiency of sulfur results in symptoms that are quite similar to those noted when nitrogen is in short supply. In both cases, the plants become chlorotic and growth is stunted. The difference is that the youngest leaves are the first to turn yellow when sulfur is deficient, whereas the oldest leaves are the first when lack of nitrogen is a limiting factor in plant growth. Sulfur-deficient plants tend to have very slender and very woody stems. Growth of roots is large in relation to that of other parts of the plants.

Problems Encountered

The use of elemental sulfur for overcoming deficiencies of this element presents some interesting problems. The sulfur first must be oxidized to sulfuric acid. This is largely carried out by *Thiobacillus thioxidans*, a very active, sulfur-oxidizing microbe that appears to be universally present in soils. The sulfuric acid reacts with the soil bases to form a sulfate, usually calcium sulfate. Thus, sulfur is a very effective acidulating agent that serves a very useful purpose on alkaline soils. In areas of naturally acid soils, which applies to most of the high-rainfall regions of the earth where sulfur-deficiency is most likely to develop, applied sulfur adds to the acidity, often with very bad results. For each 100 pounds of elemental sulfur applied to the soil, more than 300 pounds of pulverized limestone is required to neutralize the acid resulting from its oxidation. This acid effect, of course, is not unique in fertilizer materials.

Another cause of sulfur deficiencies is that the sulfur content of fertilizers is being rapidly reduced because of the need to increase their percentages of nitrogen, phosphorous, and potassium, thus economizing in bulk with related savings in freight and handling charges. Thus, the tendency is to substitute ammonium nitrate for ammonuim sulfate and to make use of triple superphosphate, which contains little or no calcium sulfate, rather than the lower grades. Most of the potash is supplied as the chloride. A variety of other sulfur-free fertilizers are available for use, such as anhydrous ammonia, urea, and monoammonium phosphate. In some areas, liquid phosphoric acid is being fed to plants by way of irrigation streams.

The sulfur content of the fertilizers used in the United States during 1955 was estimated at 1,400,000 tons in comparison with 1,880,000 tons for 1948, when a considerably smaller tonnage of fertilizers was used.

It is conceivable that as much attention will soon have to be given to the problem of supplying adequate amounts of sulfur to the soil for plant-nutrient purposes in areas some distance removed from industrial centers as is now being given to preventing a lack of nitrogen, phosphorus, and potassium, and of the secondary and trace-nutrient elements from being limiting factors in crop production in these areas. In that case, the choice may be between elemental sulfur and gypsum, the latter being supplied either as such or as a constituent of a lower grade of superphosphate. The important point here is that the possibility of a deficiency of sulfur for the growing of the highest acre yields of crops consistent with economy of production must be more carefully kept in mind with the continued modernizing of the fertilizer industry. The current trend toward increasing use of concentrated liquid fertilizers with low sulfur content adds to the complexities of the problem.

This report is taken from Section V of the "Sulphur Manual" issued by Texas Gulf Sulphur Co., New York. The section was prepared and edited by Dr. Firman E. Bear, editor of "Soil Science" and an authority on soils and plants.

Nutrition Problems

One of the more troublesome problems in human nutrition in tropical regions is the low-protein and low-mineral values of much of the food that is available for consumption. And the quality of the proteins in these regions tends to be low. This applies particularly to methionine, an essential amino acid that cannot be reconstructed by man out of other sulfur-containing compounds. This low content of methionine no doubt is due largely to a lack of available sulfur in the soil. All the sulfur contained in soils, whether in organic matter or in reduced-mineral form, soon is changed to the sulfate and, as such, is readily lost by way of drainage water. This applies particularly to regions of high temperatures, long crop-growing seasons, and high rainfall.

The same principles apply to nitrogen, an essential constituent not only of methionine but of all the other amino acids. Thus, all the organic and the ammonia forms of nitrogen in the soil are rapidly changed to nitrate by the action of special groups of nitrifying bacteria, and the soil has no fixing capacity for the nitrate ion. The low content of both sulfur and nitrogen in tropical soils explains why such

(Continued on Page 73)

Increase Predicted For European Fertilizer Output

Outputs of potash and phosphate fertilizers in Europe are expected to maintain their present rates of increase, but output of nitrogenous fertilizers during 1960-61 is expected to show an increase of 11 per cent, compared with a rise of only 6 per cent during the previous year.

THE output of nitrogenous fertilizers in the area of the Organization for European Economic Cooperation (O.E.E.C.) should over the year 1960-1961 show an increase of 11 per cent, compared with a rise of only six per cent for the previous year. Potash fertilizers are likely to maintain about their present rate of increase (7%), while, over the same period, output of phosphate fertilizers may rise by only one per cent.

These forecasts are made in the 10th O.E.E.C. study on "Fertilizers in Europe" and also are reported in the June 17 issue of *Chemical Age*.

In 1959-60, O.E.E.C. production of fertilizers showed a steady increase over 1958-59. For both phosphate and potash, the rate of expansion increased — production totalling 3.9 million tons of P_2O_5 and 3.6 million tons of K_2O—representing rises in the order of six and seven per cent. Nitrogenous fertilizers, up six per cent to 3.9 million tons (in terms of N), showed a rate of growth (plus six per cent) slightly below the 1958-59 figure.

Capacity for all three types of fertilizers on July 1, 1960 was greater than a year earlier. Potash capacity amounted to 3.9 million tons of K_2O, up 11 per cent; nitrogen fertilizer capacity was up 5 per cent to total 4.6 million tons of N, and phosphate capacity rose two per cent to total 4.8 million tons of P_2O_5.

Imports and Exports

Imports in 1959-60 from non-member states accounted for about two per cent of the total nitrogenous fertilizer supply — about the same as in the previous year. In the case of phosphate fertilizers, there was a sizeable decline in imports from non-O.E.E.C. sources—by more than 70 per cent; while potash fertilizer imports rose three per cent.

Nitrogenous fertilizer exports to non-O.E.E.C. countries, after a decline in 1958-59, rose 24 per cent in 1959-60 to reach 894,000 tons of N. Exports of phosphate and potash fertilizers rose by 27 per cent and 21 per cent to total 256,000 tons of P_2O_5 and 760,000 tons of K_2O. The market represented by non-member countries is important for fertilizers and accounted for 56, 43, and 32 per cent of total O.E.E.C. exports of nitrogen, potash, and phosphate fertilizers respectively.

Nitrogenous Fertilizers

A more rapid production rise is forecast in 1960-61, but consumption is expected to rise to a smaller degree. Exports should rise, but imports are likely to fall. The rate of increase of 11 per cent in production forecast for 1960-61 is likely to slow down during 1961-62.

Italy, second largest producing country, expanded output at a rate of 11 per cent, and the United Kingdom expanded output by 12 per cent, to reach 590,000 and 400,000 tons respectively. German output remained stable at 1,050,000 tons.

The output of urea rose sharply in 1959-60 by 35 per cent, against 21 per cent for the previous year. Calcium cyanamide, after a spurt in production of 11 per cent between 1957-59, registered an eight per cent decrease. Ammonium nitrates production, almost stable in previous periods, swung 10 per cent up in 1959-60.

Consumption of ammonium nitrates rose 13 per cent, but consumption of ammonium sulfate dropped nine per cent. The largest relative increases were in urea, up 130 per cent; in complex fertilizers (in terms of N content), up 21 per cent; and in "other nitrogenous fertilizers," up 26 per cent. Ammonium nitrates accounted for 40 per cent of total nitrogen consumption in 1959-60.

Phosphate Fertilizers

As stated previously, a slight slowing down in production is expected in 1960-61, with consumption expected to rise four per cent. In the 1959-60 production of 3.92 million tons, basic slag accounted for 1,285,000 tons P_2O_5, an increase of 12 per cent. Production of superphosphates, in terms of P_2O_5, rose

(*Continued on Page* 73)

Arcadian® News

Volume 6 | Nitrogen Division, Allied Chemical Corporation | Number 8

Turf is a Big Market for Fall Fertilizers

The green grass in home lawns, playgrounds, golf courses, airports and other non-crop land is a huge and expanding market for fertilizers—spring, summer and fall. It is a particularly good sales opportunity in the fall. Turf experts recommend a heavy application of fertilizer to established grass in the fall. Early fall is also the best season for starting new lawns and renovating old ones.

Year-round Market

Right now is an excellent time to go after this year-round market. More than half of the home-owners who have lawns use fertilizer, and an even bigger share of the commercial turfed areas are being fertilized to keep them lush and green.

Non-farm uses of fertilizer now make up about 15% of the total tonnage sold and much more than 15% of the money spent for fertilizers. Turf gets the biggest share of this non-farm fertilizer. Turf is a fertilizer market that is seldom hurt by drouth and it is unaffected by government crop reduction programs.

Beautiful green turf is the pride and delight of the grower. Help him to grow better grass with fertilizer and you are launched in a profitable market. Today it's easy to produce the easy-handling, odor-free, concentrated fertilizers containing slow-release nitrogen that turf growers need and want for best results.

Nitrogen Division, Allied Chemical Corporation, can supply you with the nitrogen products you need for making high-quality turf fertilizers in the most popular and efficient plant food ratios, such as 3-1-1 and 2-1-1.

Turf grass needs plenty of nitrogen along with moderate amounts of phosphate and potash. The average lawn is mowed once a week through a long growing season, with an inch or so of growth removed at each clipping. This means that a tremendous amount of leaf surface is produced each year.

Methylene Ureas

To keep this new growth coming along regularly to maintain a well-kept lawn, the shallow-growing roots of turf grass need a steadily available supply of plant foods. The usual forms of nitrogen which are quite satisfactory for short-season or deep-rooted farm crops tend to become available too fast and to disappear from the shallow root zone of close-cut lawn grasses.

To maintain the steady, even growth that makes a good lawn, your fertilizer needs the slow-release, long-lasting nitrogen in methylene ureas produced by Nitrogen Division, Allied Chemical Corporation. For high-analysis turf fertilizers, it will pay you to use ARCADIAN N-dure, ARCADIAN Urea 45 and one of the ARCADIAN U-A-S Nitrogen Solutions. For less concentrated fertilizers and for formulas containing a smaller percentage of nitrogen from the slow-release methylene ureas, ARCADIAN DURANA Nitrogen Solution is ideal for use in ammoniation.

Small Package Market

The turf market for fertilizer is largely a small-package market. But there are many repeat customers for high-quality turf fertilizers and they come back for more several times a season, not just once a year. This helps you to develop year-round tonnage by building a reputation with satisfied customers.

Right now you can get ready for the fall turf fertilizer sales season. By getting production under way now, you can cash in on the fall season and also produce turf fertilizers for 1962 ahead of your production of regular fertilizers.

See your Nitrogen Division, Allied Chemical, technical representative. He will advise and assist you on the formulation and production of high-quality turf fertilizers. Contact: Nitrogen Division, Allied Chemical Corporation, 40 Rector Street, New York 6, N. Y.

Arcadian News for Fertilizer Manufacturers from Nitrogen Division, Allied Chemical

Your choice and care of HOSES

Hoses and their fittings are important equipment in your plant. Frequent handling, often under difficult conditions, makes it advisable to choose the right hoses and use them well. Get the best possible recommendations from your supplier. Let him know what kind of liquids will be going through your hoses and fittings. Indicate the maximum working pressure to which a hose will be subjected. Then he can provide equipment that will perform safely for a long time. Here are some factors to consider when ordering hose equipment:

Pressures

In fertilizer manufacturing, anhydrous ammonia exerts more pressure on hose than any other material. Remember, vapor pressures are only a guide to determine probable working pressures of a material. Sometimes it is necessary to apply 20 pounds or more of pressure beyond vapor pressure to assure satisfactory operations with an ammoniating solution.

Vapor pressures in tanks are more the result of temperatures of the vapor and the surface of the liquid than mass liquid temperature. Such pressures can develop in most parts of the country even though atmospheric temperatures never reach high levels.

Approximate Vapor Pressures (Gauge) of Some Materials in Pounds per Square Inch

	104°F.	120°F.	130°F.
Anhydrous Ammonia	211	272	316
Nitrana® 6 Solution	46	68	—
Nitrana 3MC	34	50	61
Urana® 10	22	35	44
Urana 6M	17	27	34

Positive displacement and some centrifugal pumps are capable of developing pressures beyond the safe limits of hose equipment. Relief valves can protect against runaway pressures. Without these valves, serious situations can suddenly develop. Excessive pressure can rupture the hose or force it off its couplings. Keep this in mind when ordering hoses for acids, ammoniating solutions and anhydrous ammonia.

Hose Construction

Specific hose, fittings and gaskets should be provided for certain chemicals. It may be dangerous to use the wrong hose for economy or convenience.

For example, forged steel fittings and steel armor protection on hoses that handle anhydrous ammonia would be quickly destroyed by acids, and ammoniating solutions. Rubber is suitable for phosphoric acid and nitrogen solutions, but it is damaged by sulfuric acid.

Stainless steel is stronger than aluminum, and is preferred for the ammoniating solution hose fittings. Use appropriate materials for gaskets in the couplings, and make sure they are of the right size and in good condition.

Remember that ammonia gas—and, conceivably, liquid solutions—are under considerable pressure at one end of the compressed air system. Therefore, at the tank car you should use hose made for compressed air. Use steel, malleable iron or stainless steel fittings for air hose.

The hose manufacturer must be trusted to supply hose for the job as described, but choice of fittings often is left to the buyer. Frequently the buyer attaches his own fittings, particularly when replacing them on old hoses. Fixing of fittings on heavy hoses that handle hazardous materials is *no job for amateurs*.

Where quick-acting couplings are used, every precaution should be taken to make certain there is no pressure in the system when the coupling is being disconnected. A small valve for bleeding off pressure—and the liquid or gas—is a worthwhile addition.

For hazardous products, four large bolts on each hose clamp are highly recommended. There have been some bad accidents caused by the failure of bands or inadequate clamps on hoses.

Use and Maintenance

After hose equipment is installed, it will pay you to see that it is used and cared for properly. Some major causes of failure or short life of hoses and fittings are:

- Kinks at the ends of inserted fittings; kinks caused from not using pipe elbows when advisable, or by poor handling and storing. Hoses should be stored straight and flat, horizontally.
- Deterioration from sun, excess heat, oil, grease and water. You can prevent water from entering the fabric of raw ends at the couplings by coating with rubber cement.
- Strain on tank car valves and at other points. Use short nipples at tank cars to avoid excessive strain.
- Corrosion and wear of metals. Wear in the threads of stainless steel and aluminum will weaken these points in the line. Careful inspection before every use and cold water pressure tests at least four times greater than the working

pressure, conducted twice a year, will go a long way toward avoiding accidents.

When a hose is removed from duty, it is a good idea to flush out residues with water. This may avoid injuries to plant personnel.

Workers should wear chemical-plant safety goggles, full-face shields, protective head-gear and full-length chemical-plant rubber gloves when connecting or disconnecting tank cars. Ammonia-type gas masks should be available for workers who may run into emergencies while handling anhydrous ammonia and ammoniating solutions. A good supply of water near the connected hose, but protected from possible spraying, is a sensible precaution.

Some operators follow a practice of replacing all hose every two years. Like a chain, the hose is no stronger than its weakest link. Make sure all your "links" are strong enough.

Ask Nitrogen Division

Nitrogen Division technical service men have a thorough knowledge of methods used by manufacturers to speed production of good-condition mixed fertilizers. It will pay you to get their advice and assistance. This service is available to customers without charge. Simply contact Nitrogen Division, Allied Chemical, 40 Rector Street, New York 6, N. Y. Phone: HAnover 2-7300.

Organize Bulk Handling for Farmer Application

It's time to get set for bulk handling of fertilizers spread by farmers and by custom application. Most fertilizer is bought in bags and spread by farmers. You can increase fertilizer tonnage and profits by helping dealers move into bulk handling and spreading. Everybody down the line saves time, labor and expense. And you have an excellent opportunity to get and hold more customers.

Your best bet is to strengthen the weak link in most bulk-handling systems – the final stage of getting the fertilizer into the farmer's grain drill, planter or broadcast fertilizer spreader. In custom spreading, your dealer is limited by the number of expensive bulk trucks he can afford and the road time travelling to farmers' fields. Simple and inexpensive bulk tanks or bins for use on the farmer's truck or wagon are the real answer to bulk-spreading sales and profits.

Rent Bins

Your dealers can sell or rent these simple, sturdy bins of plywood or steel to a large number of farmers. A hoist or fork lift easily places a bulk bin on a farmer's truck. A push button fills it at your plant or dealer's storage. The farmer can bring the bin back for quick bulk fertilizer refills as often as needed. Or, you lift the bin onto the next truck.

Make It Easy!

The portable bins which unload by gravity direct into the farmer's grain drill or the hopper on his fertilizer spreader, are the simplest of the new bulk-handling systems. Self-unloading feed or grain wagons with auger attachments are also excellent for fertilizer hauling and handling. New planters, drills and spreaders have larger fertilizer hoppers to simplify filling from bulk or bag. Help make it easy for the farmer to handle bulk fertilizer for row or drill seeders and broadcast spreaders and you increase your sales of your most profitable mixed fertilizers.

When you organize for bulk handling of fertilizer all down the line, your farmer customers know you are in business to provide efficient service. You'll be fully equipped to handle the needs of the farmers who buy the most fertilizer. Bulk handling and bulk spreading are becoming a necessity in modern farming, where back-breaking chores must fade out of the picture. Good farmers know that high yields require plenty of fertilizer in the row and plowed down. Make it easy for them to apply your fertilizer, and you get more business.

Results on thousands of farms show that farmers who turn to bulk handling and spreading use more fertilizer. Many of the dollars saved on labor and handling are spent on more fertilizer. The back-breaking chore of handling bags is no longer a bottleneck to fertilizer sales. Bulk up your fertilizer business by getting organized for bulk handling!

This self-unloading bin with auger attachment from tractor take-off automatically unloads fertilizer from the bin into the distributor. This type of equipment enables the farmer to do his own custom spreading of bulk fertilizer.

NOTE: The information furnished in this issue of the ARCADIAN News is obtained from studies and tests considered reliable; results, however, are not guaranteed.

Helpful Fertilizer Data in 1959 Census Reports

The fertilizer industry is finding a "gold mine" of helpful information about farms and farmers in their areas in the 1959 U.S. Census of Agriculture. Report sheets (AC 59) for each state and county are for sale at 10 cents each by the Bureau of the Census, Washington 25, D. C. There is a minimum of waste because you can order sheets for only the states and counties you specify.

Much publicity has been given to the decrease in number of farms during recent years. Census of Agriculture reports show that this is true, but in most counties the number of acres per farm has increased. Of special importance to fertilizer people is the fact that from 1954 to 1959 the number of acres fertilized in 48 states increased from 122,809,445 to 132,133,068 (7.6%) and total tons of commercial fertilizer used by farmers increased from 18,869,117 to 19,673,490 (4.2%) during the same period.

The Census of Agriculture report sheets provide much more information of practical importance to fertilizer men who wish to study their markets. For each state and each county they give 1959 and 1954 data on a comparable basis, for the following: total number of farms; total acres in farms; average size of farms; value of land and buildings – average per farm and per acre; land in farms according to use, e.g., cropland, pasture, irrigated land; and, number of farms by 12 size categories and 4 types of operators: full-owners, part-owners, managers, and tenants.

Answers to some rural sociological questions are given, such as: average age of all farm operators reporting; number of farm operators 65 or more years of age; number residing on farm; number working off their farms; and number with "other income of family exceeding value of products sold."

Most of the information under "Specified Facilities and Equipment" is for 1959 only. Fortunately, data on "Use of Commercial Fertilizers and Lime" are given for 1959 and 1954. They include: number of farms reporting use and number of acres on which used. Data for 1959 only are included for: farms reporting use; number of acres fertilized; number of tons of dry and liquid materials respectively for three specified crops which vary from state to state, and for hay and cropland pasture, non-cropland pasture, and "all other" crops.

Much of this information by states and counties has been made available to fertilizer people through a wall map entitled "Use of Commercial Fertilizers by Farmers" and individual State tables by the ARCADIAN News.

Detailed data on livestock and poultry on farms; livestock and poultry products sold; and specified crops harvested in 1959 and 1954 are given in the census report. The information on crops harvested, when compared with amount of fertilizer used on specified crops, gives fertilizer people powerful sales data.

Data on types of farms, such as: field-crop farms – cash-grain, tobacco, cotton, and other field-crops; vegetable farms; fruit-and-nut farms; poultry farms; dairy farms; and livestock farms – are given for 1959 only.

Also, important data on number of farms in six economic classes: (1) farms with sales of $40,000 or more; (2) $20,000-$39,999; (3) $10,000-$19,999; (4) $5,000-$9,999; (5) $2,500-$4,999; and (6) $50-$2,499 are given for 1959 only. Similar data for part-time, part-retirement, and other, are also given.

Fertilizer people know that there are two important ways to increase the use of commercial fertilizers by farmers in their areas: First – convince more farmers that they should use fertilizers and second – show farmers who are now users how they can profitably use more fertilizers on their farms.

Much of the information in the 1959 Census of Agriculture reports indicates the size of this opportunity.

For example, in the 12 North Central States the percent of all farms using commercial fertilizers is 62.3%. If this could be increased to 81.2% (the figure for the "red" counties using 15,000 or more tons) the total amount of fertilizer used would be approximately one-third greater. This would come without an increase in the average amount of fertilizer used per farm.

If this average could be increased from the 1959 average of 7.6 tons per farm to 11.2 tons (the average per farm for the "red" counties) the total amount used would be about 47% greater.

Obviously neither of these goals could be achieved in one or two years, but it is reasonable to believe that total fertilizer use in these states could be increased by from one-third to one-half before the 1964 Census of Agriculture.

GRANULAR PESTICIDES
GAINING FARMERS' ACCEPTANCE

A panel discussion on Agricultural Chemical Application was a feature of the annual meeting of the American Society of Agricultural Engineers. Two of the reports presented, one by Dr. T. A. Brindley on "Control of European Corn Borers with Granular Insecticides," and "Use and Purchase Patterns of Agricultural Chemicals," by George M. Beal and Joe M. Bohlen, were reported briefly in the July issue (p. 63).

DR. Gordon E. Guyer, entomologist, Michigan State College, discussed his extensive work with granular insecticides on vegetable insect pests. He spoke at the 54th annual meeting of the American Society of Agricultural Engineers, June 26 at Ames, Iowa. The results of the use of granular systemics on potatoes, applied in the fertilizer band, have been outstanding. During 1961, granular application equipment used for this type of treatment worked out very well. Although 1961 was only the second year of field use of this technique, two-thirds of the Michigan potato acreage was treated with granular systemic insecticides. In addition to the expected control of sucking insects, control also was secured against many chewing pests, including the Colorado potato beetle. Field data in 1960 indicated control lasted into August. To date, the results in 1961 also have been good.

Until the development of resistance, onion maggots were effectively controlled with chlorinated insecticides. After resistance was evident, it then was necessary to shift to granular phosphate materials, and these now are used on approximately three-fourths of the total Michigan onion acreage (some 8,000 to 10,000 acres). Liquid applications of phosphate insecticides, plus formaldehyde, as a seed fungicide, were used on the balance of the onion acreage.

Contamination of spinach by fly maggots presented a difficult problem to the baby food industry in Michigan, until a technique, utilizing a granular insecticide, was developed by means of which granules were deposited in the particular plant area infested by these maggots. Sprays also were evaluated, but ruled out, due to high amounts of solution required, and also to high residues deposited on the crop. Here, granular insecticides and effective application equipment solved a difficult control problem, Dr. Guyer reported.

Systemic insecticides, at moderate rates, have been used to advantage in Michigan on tomatoes, cantaloupes, and dry snap beans. Control of several insect carriers of virus diseases has been achieved. Although there have been a few mechanical problems, granules reportedly have several advantages over liquids, including more effective placement of material.

Machinery for the application of granular insecticides has evolved to a very satisfactory stage during the past 10 years in which Dr. Guyer has been working with these materials. Important points to consider regarding granules, he said, are screen mesh size, and uniformity of product, toxicity of product to crop, stability of formulated product, and amount of excess fines permitted in the finished product.

Work on forage crops has shown that granules will penetrate foliage cover, and also reduce the amount of residues on treated crops. Recent tests of several chlorinated granular materials – in varying concentrations, and on various screen mesh sizes–to control spittle bugs on certain forage crops, have indicated that smaller sized granular materials provide better control.

Numerous other uses for granular insecticides are possible Because less residue is deposited on treated crops, there will undoubtedly be additional uses for this type of formulation, Dr. Guyer feels. The ease of handling granular materials is one of the contributing factors to their rapid acceptance by growers, who will pay the added costs required for this convenience, he said. Farmers appear to readily adopt the granular program, because of demonstrated added benefits, on crops where such use has been shown to be effective.

Weed Control in Field Crops

"Granular pesticides are not new, but the granular forms of herbicides are relatively new as a commercially accepted concept," Dr. E. C. Spurrier, Product Supervisor,

Monsanto Chemical Co., St. Louis, told the group. In 1958, a limited amount of granular herbicides was used. In 1959, this expanded to the first commercial sales stage on corn and soy beans in the Mid-West. 1960 was the first year of extended commercial experience. Dr. Spurriers' definition for granular herbicides would be confined to "That group of weed killers which are applied to the soil, and act primarily through root absorption, or plant tissue uptake." The greatest public acceptance is for the granular pre-emergence weed killer—one which is applied to soil at planting time, and depends primarily on rainfall or overhead irrigation to position it for greatest weed seedling contact. Absorption of the chemical into germinating portions of susceptible, as well as tolerant, seedlings is permitted. Differential digestion, or metabolic breakdown of the absorbed chemical by the sensitive or tolerant seedlings then permits selective control of plant species — susceptible seedlings die, and tolerant ones live — thus giving selective control of weeds in crops. Granular forms of post-emergence herbicides, such as 2,4-D and others, would permit less foliage contact where the site of absorption is critical, and would be of less value for weed control.

Acceptable inert carriers for granular herbicides include clays, vermiculite, hulls, shells, corn-cobs, etc. Ammonium sulphate also was used as an inert for one pre-emergence material. The choice of carrier is determined by mode of action of toxicant, the amount of lateral movement desired, etc. Some herbicides are less effective as granules than as sprays—others are more effective in granular form. For toxicants with a low order of solubility, greater accuracy and evenness of application is needed than for more soluble materials.

A recently agreed upon definition for a granular herbicide restricts this term to "Any acceptable inert between a 4 and 80 mesh size, based on the American standard mesh system. The finished formulated product of any given mesh size range should not have more than 10% of its content outside of the specified range," to comply with arbitrarily accepted industry standards. Because the mode of action of herbicides varies widely, the manufacturer must determine the inert, mesh size range, and percentage of toxicant that permit maximum herbicide action and utilization of the chemical—within good manufacturing practices. Because of this necessary variation in product, chemical manufacturers must cooperate very closely with equipment manufacturers, to permit flexibility in equipment design, if best application techniques are to be utilized. Experiment station evaluations also are extremely important in the coordination of industry efforts with educational programs.

Most granular chemicals perform as well as liquids. Comparative performance in the field depends greatly on uniform distribution — a factor involved in reports of unsatisfactory performance of granular pre-emergence herbicides.

Most granular chemicals perform equally as well as liquids, with some better and some worse. Comparative performance in the field depends greatly on uniform distribution, and, unfortunately, this has been a factor involved in reports of unsatisfactory performance of granular pre-emergence herbicides.

In the past, product quality of granular formulations has not always been of the best. Much has been learned by industry from one year of commercial experience in 1960. Improvements of product quality have been made since 1960. Such as, reducing the percentage of fines in the finished product, improved packaging, improved blending of materials, and better labeling of chemicals. Applicating equipment definitely has been improved in design and in metering. Because of these improvements, there were considerably less problems encountered with these products in 1961, than in previous years.

It is estimated that in 1960, in Iowa alone, almost one million acres of crop land were treated with granular herbicides. This acreage, no doubt, increased in the spring of 1961. In other areas, the use of preemergence granules is increasing. In 1961, several million acres of corn, soybeans, onions, and vegetable crops were treated with granular herbicides.

Granular pre-emergence weed killers are finding increasing acceptance for weed control in horticultural crops. In certain areas, crop tolerance is improved, and weed control is more consistent over wider ranges of climatic and cultural conditions. The handling characteristics of the chemical can be improved by granulation, in some cases. Of special significance, is the increased use of granular pre-emergence chemicals applied as post transplant, or lay-by treatments over established vegetation. Quite recently, Monsanto has received label registration for repeat applications of granular Vegadex over spinach, celery, tomatoes, and peppers; granular Randox for lay-by or post-transplant treatment for onions, tomatoes and potatoes, and granular Randox T for second and third treatments on muck grown onions. More clearances are apparently forthcoming. Liquids would not be as satisfactory for these specialized purposes, because of possible contact foliage injury and restricted soil placement which interferes with weed control. Granular materials reduce or prevent, to a great degree, the possibility of

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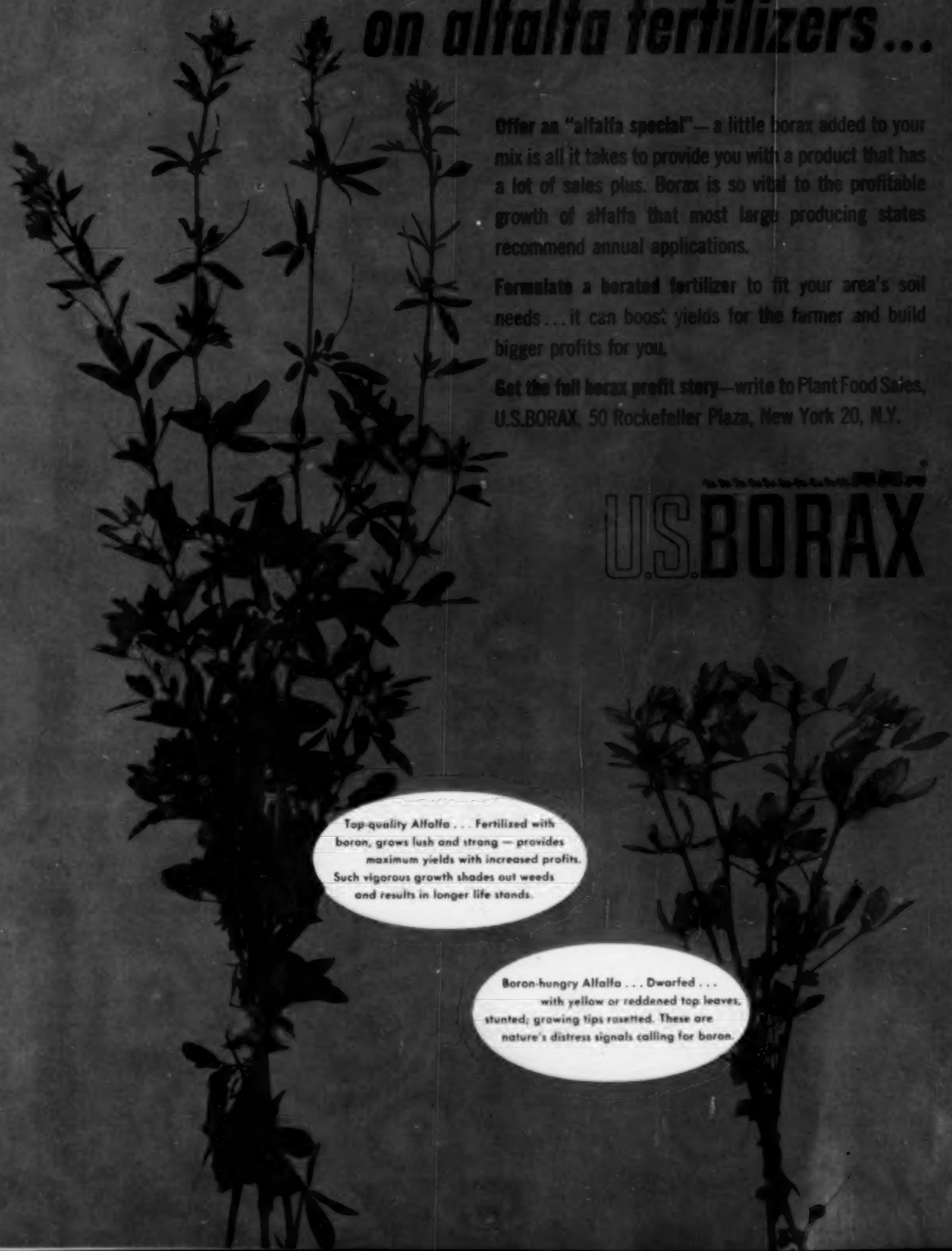

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New types of granular formulations, which can be tailored to match mode of action, flow characteristics, and other inherent capabilities of both the old and new chemicals, may be coming to the market in the future.

prolonged tissue residues which could be problems with liquid treatments when used for such purposes.

It does not seem impossible, nor improbable, that new types of granular formulations will be coming to the market in the future, which can be tailored to match mode of action, flow characteristics, and other inherent cababilities of both the old and new chemicals. The field is wide open. Certainly, the field of granular herbicides can only improve, just as equipment has and will improve, Dr. Spurrier concluded.

Control of Soil Insects

Dr. J. W. Apple, professor of entomology, University of Wisconsin, Madison, indicated that granular insecticides have been used extensively during the past 10 years for soil insect control on various crops. While the direct application of granules started in 1953, the major swing to this type of formulation took place in 1958. Aldrin or heptachlor granules were applied with starter fertilizer on corn planters for control of soil insects attacking corn. Then, the high-analysis starter fertilizers came into use, and, as these materials must be placed to the side and below the seed with new deep-placement type planters, farmers could no longer secure satisfactory insect control from an insecticide in starter fertilizer. To fill this need, the granular chemical row crop applicator was developed. The reported increase in soil insecticide usage in granular form in Illinois jumped from 6% in 1957 to 48% in 1960. It has been estimated that 6,000,000 acres of corn in the Midwest were treated with row applications of soil insecticides in 1960 — most of these being in the granular form. In addition, granules were used on a good many of the 4,500,000 acres of corn which received a pre-planting broadcast treatment.

The two most destructive species of corn rootworm are the northern and western. They cause varying degrees of plant lodging when corn is planted continuously in the same field. Dr. Apple briefly reviewed research on rootworm control to point up the relative value of granular formulations. In 1954, in Wisconsin, granular aldrin was as effective as emulsion sprays in broadcast applications against northern corn rootworm. In another test in Wisconsin, one-half pound per acre of aldrin or heptachlor, applied as granules to the row, resulted in 98.7% reduction in rootworm lodging, whereas the recommended one pound per acre (broadcast) of spray, gave 100% correction of plant lodging. Although lodging was reduced by 95% or more, actual rootworm mortality from granular row treatments may be no higher than 70 to 75%, even with excessive dosages. Bigger of the Illinois Natural History Survey, found 71.9% northern corn rootworm mortality from the use of row-applied insecticidal granules in plow-plant operations. 86% reduction of western corn rootworms in Nebraska was secured with one-half pound of heptachlor granules per acre in the row; control was boosted to only 88% when the dosage was doubled to one pound. Earlier work (1953) by Cox and Lilly in Iowa, was in contrast to these results, as 96% reduction of rootworms was produced by one-half pound of aldrin or heptachlor per acre as a spray application in the row at planting. These same investigators reported that the following-year preplant broadcast treatment of one pound per acre on level-planted corn can be expected to give rootworm control of around 95%. In Dr. Apples' opinion, these results indicate the difficulty in obtaining a high degree of rootworm control from aldrin or heptachlor granules applied in a narrow band (1 to 2 inches) with the corn planter. When light to moderate rootworm populations (10 to 50 per plant) are present, this inferiority of granules in the row should not alter significantly the amount of plant lodging. However, under severe population pressures, a difference of 15 to 20% in control could be of major consequence.

Recent detailed studies of granular formulations by Dr. Apple, as row treatments against northern corn rootworm, indicate greater protection resulted from low concentrations (5%) and granules of small mesh size (30/60); when compared with high concentrations (20%), and coarse mesh (8/15) granules. This experiment used heptachlor at the 0.25 pound per acre rate; which is one-half that normally recommended. Where granular deposits of 274 particles or more per lineal foot of row were laid down, satisfactory reduction in lodging was secured.

Wireworms are the next most important group of soil insects against which granular insecticides are used on corn. Considerable research has been done with insecticides against wireworms, but most was with broadcast sprays, or with treated starter fertilizers, and not with granular formulations. In one experiment, workers reported only 60% wireworm reduction from granules in the row, as compared with 88% control in fields receiving a pre-planting broadcast spray, followed by discing. Research in Iowa, in 1958, indicated wireworm mortality was increased by increasing the number of insecticide granules

(*Continued on Page* 71)

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AG CHEM PRODUCTION ROUND TABLE

Chemical Analysis In The Fertilizer Industry

by Vincent Sauchelli
Chairman, NPFI Committee on Chemical Control

TONGS, goggles, Gooch crucibles, quinolinium solution, citric molybdate, quinolinium phosphomolybdate, molybdovanadate reagent, aqua regia, thymol blue and phenolphthalein.

Whew! What gives? Some new kind of occult Esperanto Language?

Not at all. That's chemists' talk. The air was full of this chemists' jargon at the Phosphorus Workshop held at Purdue University, July 6, 7 and 8. It was cosponsored by the National Plant Food Institute, the American Association of Fertilizer Control Officials and the Association of Official Agricultural Chemists. The Workshop attracted 61 chemists from control laboratories in all sections of the United States and neighboring Canada. 41 were from the fertilizer industry.

To have participated in the 3-day sessions and have felt the infectious enthusiasm of the analysts as they weighed, titrated, and measured reagents was an experience to remember. All present voted this workshop the best of its kind. Two similar workshops have previously been held at Purdue. The Biochemistry Department at Purdue University went all out to assure a successfully instructive meeting: Dr. F. W. Quackenbush and Dr. E. D. Schall, and their staff, deserve the gratitude of the fertilizer industry and of the state chemical control officials for the time, expense, and effort they put into the preparations and subsequent organization of the workshop. They were ably assisted in the instruction phase by nationally known chemists including, William Hoffman and Rew Furretti of the U. S. Department of Agriculture chemical laboratories, in Beltsville, Md.; Carrol H. Perrin and P. A. Ferguson of the Canada Packers, Chemical Research Laboratory, Toronto, Canada; John A. Brabson, Tennessee Valley Authority; and Frank Johnson and George H. Kramer, Jr., University of Missouri.

The Workshop was arranged primarily to enable chemical control chemists to become familiar with the procedure and technique for determining phosphorus in fertilizer by a new, highly accurate Quinolinium Method of analysis. This method, originated by Mr. H. N. Wilson, research chemist at the Imperial Chemical Industries, Ltd., Great Britain, was subsequently modified by C. H. Perrin. European and American collaborative studies support its claims for recognition and acceptance. It is simple, speedy, quickly and easily learned even by laboratory technicians, requires no special laboratory facilities, and gives remarkably accurate and reproducible results.

One important reason for studying the merits of this new method is the feeling among many analysts that the AOAC official Volumetric Method now generally used by state and industry laboratories for determining phosphorus gives a result that is biased on the high side. The Wilson-Perrin Quinolinium Method gives a result that comes much nearer the true value. Up until this year, "the true value" reflected only average results from a collaborative study. During the past year, the National Bureau of Standards (NBS) made available, for a collaborative study on phosphorus analytical methods, some pure ammonium dihydrogen phosphate crystals. The pure crystal has a definite quantity by weight of phosphorus and nitrogen, and, therefore, serves admirably as a standard by which to measure the accuracy and precision of various methods of analysis. Hence, for the first time, control chemists have a criterion for evaluating the efficiency, accuracy, and precision of the official Volumetric, Gravimetric and Photometric Methods currently used to determine phosphorus in fertilizer. The interest generated by the Wilson-Perrin Quinolinium Method among control chemists is thus understandable, since it has been used in a collaborative study in which this NBS standard was analyzed and the results agreed very closely with the calculated "true value" of the phosphorus.

At the Purdue Workshop, for example, the fertilizer sample used for analysis was a 4-16-16 mixed fertilizer. The mean of 49 results, as determined by the Wilson-Perrin Gravimetric Method, was 16.29% P_2O_5 with a standard deviation of 0.06; by the W-P Volumetric Meth-

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od, the result was 16.23 with standard deviation of 0.67. When it is considered that at least 90% of the chemists were unfamiliar with the method and were using it for the first time, the high level of accuracy attained was truly remarkable.

General Comments

Chemical quality control in the fertilizer industry is unquestionably a tough job. The chemical analyst must deal with bulky, fairly crude materials prepared in large volume. Such materials vary in particle size, density, shape, and composition. To draw a good representative sample from huge piles of such materials comprising many tons of numerous batches, each in turn varying from one another, is a difficult task. That the chemical control staff does quite well under such demanding circumstances is commendable.

In years past, chemical control was comparatively easy because the fertilizer mixtures were simpler to sample and analyze. Today's fertilizer formulations are much more complex, and greater skill and knowledge are required to analyze them. The trend in manufacture is to go to higher concentrations, which compounds the complexity.

You can picture the problem better if you will consider the general types of fertilizers being produced in different regions of the country: conventional or "powdered" fertilizer; granulated fertilizers, some with uniformly shaped granules and others of the non-uniform kind; and so-called semi-granular fertilizer having particles which vary in size from 4 mesh to 100 mesh. These fertilizers are shipped in bulk or bags. Other fertilizers are shipped as liquids, some under high pressure.

The chemical laboratory techniques of sampling and analyzing these various kinds of materials have had to be modified and improved to keep up with the changing conditions. New methods have had to be developed in some cases.

The chemical analytical laboratory is indispensable in the production of modern chemical fertilizers. Its role is to control quality in the manufacturing process. The control laboratory advises management on the economics of purchases of raw materials and protects it against failure to pass state inspections; prevents overformulation and other inefficiencies that cost the firm real money. In brief, the control laboratory in the fertilizer industry is, at present, primarily a defense unit. This role, while perhaps unavoidable as the industry's business is now conducted, does not, however, take advantage of the much greater services the laboratory is able to perform. Nelson C. White, vice-president and Chairman of Committee on Long Range Planning of International Minerals and Chemical Corporation, explains it in this manner:

"The control laboratory should be one of the strongest links in the management chain, connecting research, production, and sales; acting as an extension of each and insuring a strong, safe bond to the customer. It should be linked to research, either in its own company or to the vast body of new information made available by outside organizations. It should be prepared to translate this information into practical terms.

"We are a segment of the chemical industry. Other segments have control laboratories. Are there questions as to the role they play? Not many. Everybody knows that they are there to protect their company's most precious asset, its reputation, its brand name. Who checks on them, what disinterested arbiter protects their customers, the buyers of gasoline, soaps, plastics and all the other things you can name? None, of course.

"But, two vitally interested groups, the customers themselves and competitors for those customers, provide all the inspection needed. It is the customer and the competitor whose eternal vigilance keeps the manufacturer jumping to produce the best product."

Why is it different in our industry? Because, as I see it:

The role of the chemical control laboratory in the fertilizer industry has not yet attained the stature it deserves. A complete change in the philosophy of management and of the chemists themselves is needed. Mr. White points the way. Management that is alert to the trends in improved marketing appreciates the services which can be rendered by the control laboratory. As competition becomes keener, especially now that the newer, modern, big units have entered our industry, the chemical control laboratory will be needed to link research, production, and sales; to find proper source materials and check their suitability and use in all the steps of processing, down to the finished product. The control laboratory should be the central unit in a management team concerned with the production of goods of guaranteed maximum value. The company dedicated to establishing and maintaining its integrity and reputation for dependable, quality goods as a fundamental conviction of good business policy will be in an excellent status to survive, serve and prosper.

In these newer developments and changes, the need arises for improvements in methods of analysis. The great interest shown by chemists in the Wilson-Perrin Quinolinium Method is one answer to this need. Analysts in control laboratories are conscious of the importance of utilizing the most accurate and precise methods to satisfy consumer and producer under the controls stated in the fertilizer laws. If a method proves, by extensive investigation, to be simpler and speedier and still attain a high degree of accuracy and precision, it deserves official sanction with as little delays as possible. The AOAC will, in all probability, shortly be giving serious consideration to the merits of the Quinolinium Method as demonstrated by the large representative group of control chemists at the recent Purdue Workshop.★★

AG CHEM

Washington Report

by Donald Lerch

Farmers Today Want Technical And Economic Information

THE entire farm scene is changing. And those in the agricultural chemicals industry who do not change with it may be left behind as competition becomes tougher.

This is the view I get from many farm leaders here. Those in the business of supplying farmers with information, as well as with production input items, are saying much the same.

Here is the picture:

The number of commercial farmers is going down. These are the real buyers of capital goods, new seed, more fertilizer and pesticides today. At the same time, their purchases of input items are going up.

What's more significant is the *way* they are buying. In the past, farmers depended largely upon their own past experience and the experiences of their neighbors for their buying guides. Research has been turning out so many new products and practices that past experience is not enough.

Now, successful farmers are turning more to research scientists in indusrty and in government. They are starting to demand that salesmen and dealers know the technical information about how the product will make more money for the farmer.

In other words, the average successful farmer is willing to read the label. But, he wants more technical and economic information about the product than he can find on the label. If he does not get it from the producer, there are indications that he is switching to others who can tell him what he has to know.

A new factor is coming into the picture, too. Under the Kennedy Administration, the role of the Cooperative Extension Service is changing. It is becoming broader. Extension Service Director E. T. York says that county agents must become more concerned with the entire rural economy. Rural Area Development is being stepped-up. The role of county agents from now on will be to organize and coordinate programs to help the entire rural economy move ahead.

Involved are problems of bringing new industry into rural areas, improving schools, sanitation, community centers, hospitals, and the like. With these added community or area responsibilities, the average county agent likely will have less time to communicate technical information to farmers.

It all adds up to greater responsibilities upon manufacturers and their dealers to provide all the added information about products that farmers need today. Communications are becoming ever more important in keeping business and agriculture moving ahead.

Food Is Best Bargain

Some of Agriculture Secretary Orville Freeman's programs are controversial and likely will remain so. But one effort virtually all farm leaders support is his program to tell consumers that their biggest bargain today is food. The story has many parts. For example:

Consumers today spend about 20% of their take-home pay for food, which leaves more money for spending on other goods and services. This means a rising standard of living. Production efficiency made possible by teamwork of industry, government, and farmers makes this possible.

Some 7 million people are directly engaged in farming. For 16 million others in industry, who serve agriculture or process and sell foods and fiber products, agriculture is a weekly or monthly paycheck. For every consumer, agriculture is the health and energy that comes from an abundant variety of nutritious foods at reasonable cost.

Pesticide and fertilizer manufacturers, formulators, and dealers have a key role in this story. For they can tell of the benefits of pesticides and fertilizers to the entire public as they tell the story the Agriculture Secretary is promoting — food is today's biggest bargain.

County Agent Convention

Many in the agricultural chemicals industry will be interested in the annual convention of the Agricultural County Agents Association this year. Secretary Freeman and Extension Service Director Dr. E. T. York will be among the speakers when it convenes in New York.

Industry leaders will remember that Dr. York formerly was an agronomist for the American Potash Institute, and has had a distinguished career in Land Grant College and Extension work as well. His expressed policy is to adapt Extension work to moving the economies of entire rural areas ahead.

(Continued on Page 70)

SALES BUILDER:

Now your customers can control destructive late-season insects up to 24 hours from harvest with Phosdrin® Insecticide without creating residue problems.

Phosdrin is the remarkable new phosphate insecticide that gives your customers fast knockdown and kill of the toughest insects—then disappears without leaving any residue.

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Phosdrin solves the problem

This is a problem that many growers are solving with Phosdrin Insecticide. Phosdrin kills the toughest insects fast (including strains resistant to other insecticides), usually within a few minutes of application. However, unlike most other insecticides, Phosdrin disappears rapidly after it has done its job, leaves no residue.

That is why Phosdrin can be applied up to 24 hours from harvest on many crops.

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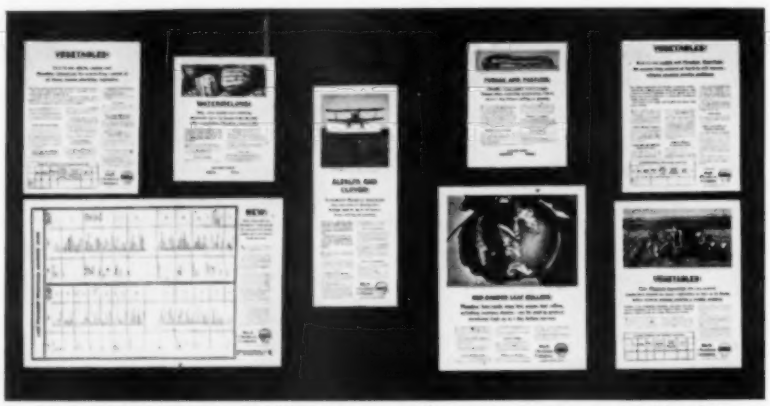

Factual, informative ads like these are telling your customers the Phosdrin story in national, regional and local publications.

Shell tells your customers the Phosdrin story

Shell is telling your customers the Phosdrin story in magazines, state farm papers, local newspapers and on radio. Some of the advertisements that have run or that are going to run are shown above.

To help you sell Phosdrin at the local level, Shell has prepared a number of leaflets for specific crops, as well as banners, newspaper mats and radio scripts.

All these materials are available from the Shell Chemical District Office nearest you. These offices can also supply you with technical information on Phosdrin and give you valuable assistance should you have a special formulating problem.

Other leading agricultural materials developed and manufactured by Shell Chemical include: aldrin, dieldrin, endrin and Vapona® (DDVP) Insecticides; D-D® and Nemagon® Soil Fumigants and Allyl Alcohol Weed Seed Killer.

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2299 Vauxhall Rd.
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MU 6-9580

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New Orleans 12, La.
529-1561

212 S. Central Ave.
Clayton 5, Mo.
VO 3-0800

55 Marietta St., N.W.
Atlanta 3, Georgia
JA 5-2986

P.O. Box 2099
Houston 1, Texas
CA 7-7655

100 Bush Street
San Francisco 6, California
EX 2-5400

Shell Chemical Company

SHELL

Agricultural Chemicals Division

Application By Helicopter

Group Plan Provides For Effective Orchard Spraying

Some 30 growers in three New Hampshire counties have found that, by banding together, they can have their orchards sprayed by air economically and can reap important benefits. Keys to the program are the utilization of helicopters and the cooperation of the chemical supplier.

WITH harvest approaching, apple growers are readying for application of hormone sprays to their orchards to prevent costly "drop" and to lengthen the picking season. This procedure, of course, is not at all unique, but, in New England at least, it has taken on a new look – application via helicopter rather than conventional ground equipment. One group of growers in New Hampshire reports particular success with this.

Some 30 growers in Rockingham, Merrimack, and Hillsboro Counties have found that, by banding together, they can have their orchards sprayed by air economically and can reap important benefits.

Although this is not entirely new and has, in fact, been attempted in the past, the erratic results achieved have kept it from becoming standard practice. The flexibility and speed of air spraying, however, continue to make it appear ideally suited to hormone applications. A major drawback has been cost, which would be somewhat high for a single grower to handle. In addition, the time required to organize and maintain a cooperative venture simply is not available to most growers.

What has made the New Hampshire project possible, therefore, is the cooperation of the chemical supplier – in this case Niagara Chemical Division of FMC. Al Lord of Niagara began the operation and handles all arrangements, technical advice and information. He, of course, can rely on Niagara's technical service staff for aid.

The use of helicopters rather than fixed-wing craft reportedly is a key factor in the success of the New Hampshire project and has eliminated the erratic results experienced in the past. The chief

These Golden Delicious apples — still clinging tightly to the tree of a New Hampshire orchard — might well be lying on the ground at this point were it not for the aid of hormone spray treatments. Hormone spraying for this purpose has taken on considerable importance throughout the nation.

advantage of the helicopter is its low flying speed and greater maneuverability. In addition, the downdraft from the helicopter's rotors causes faster settling of the spray and allows greater pin-pointing of hormone deposits onto the target areas.

The actual spraying operations are carried out by four Bell model 47G helicopters operated by Wiggins Airways, Norwood, Massachusetts. Equipment for the helicopters was especially designed by Wiggins, whose aerial application operations cover all of New England during the spraying season.

Wiggins Airways (despite the name) is a small, though well-known, fixed-base operation. The company grossed $2,247,214 last year, netting $30,961 after taxes. Its slogan is "The most versatile airways in New England." It operates a flying school, sells Piper aircraft, leases business planes, and maintains a complete repair shop and manufacturing division — all in addition to the spraying operations.

Up to 60 gallons of spray material can be carried by each Wiggins helicopter. The spray is pumped by an engine-driven centrifugal pump to some forty nozzles in a conventional boom. The helicopters apply a 40-foot swath at a speed of 25 to 30 miles per hour to insure maximum penetration and coverage of the material being sprayed.

The use of helicopters makes it possible to load materials into the tanks right next to the orchard being sprayed which affords the grower an opportunity to give last minute instructions to the pilot. The hilly New Hampshire terrain is another factor in favor of the use of helicopters.

Several advantages of air spraying in the application of hormones are cited by growers in New Hampshire. James Elton, who operates a 175-acre orchard at Hampton Falls, points to speed and flexibility as major advantages. "With air applications," Mr. Elton says, "we can move fast to meet any sudden changes in weather that would make it necessary to get hormones on the trees in a hurry." He explains that speedy action of this kind is sometimes difficult when spraying with ground equipment. Furthermore, by having a commercial air spray company handle the job, he is relieved for other duties at an extremely busy time of the year.

In addition to the speed and time saving factors, grower George A. Parker of Wilton (100 acres) lists another significant plus for air spraying. "No matter how careful you may be, it is almost impossible to avoid mechanically-damaging the apples and knocking many of them off the trees when using ground equipment," he says. "But with helicopters we don't have this problem," he concludes.

The hormone spray program employed by the New Hampshire growers will vary somewhat from year to year. Generally, Niagara's Aero Liqui-Stik concentrate, Code 396, is applied to McIntosh apples commencing somewhere between September 10-17. A second application is made about a week later, depending somewhat on the weather. When the temperatures soar above 70° F. the treatment will not last much longer than seven days, while if temperatures remain below 60° F. it will continue to be effective two to three days longer. When possible the number of applications is limited to two.

For late varieties — Golden Delicious, Northern Spies, Baldwin, etc. — a different hormone, Stikcol-D, Code 356, is preferred. Only one application of this material is needed. It lasts from two to three weeks and allows ample time for harvesting. However, in orchards where plantings of Macs and the later varieties are very much intermingled, Code 396 will be used for all trees.

Although Mr. Lord takes care of scheduling and arrangements for the joint air spray operation, payment to the airways firm is made directly by individual growers. Costs for the helicopter service are slightly less than $5 per acre.

In addition to the hormone program — the 1961 addition of which soon will get underway — the New Hampshire growers utilize air applications for scab control in the Spring and Summer. In short, they're more and more looking skyward in handling their agricultural chemical application problems.★★

Swathmaster On Piper Cub

Transland Aircraft of Torrance, Calif., has announced that its Swathmaster spreader now is being used with success with the Piper PA-18A Cub agricultural airplane.

Field performance reports under normal working conditions by Aircraft Applicators, Inc., Prosser, Wash., have verified pattern tests flown previously at Torrance by Transland. The drag of the Transland Swathmaster Cub installation is said to be no more than that experienced with the conventional pump and boom liquid system. The installation is approved by the F.A.A.

•

Plastic Pressure Sprayer

A plastic bottle strong enough to stand up to the high pressure needed for horticultural and agricultural spraying has been developed by a British firm, Testar and Swain Ltd., Birmingham, England. The two-and-a-half gallon polythene container is claimed to be an advance on metal pressure sprayers.

The unit has a metal plunger fitted to the top of the polythene bottle. The operator pumps until he feels the pressure build inside the bottle and then he releases a control tap to allow the liquid to spray through a detachable 20-inch nickel-plated, brass-angled lance. The spray can be fine, coarse or jet, and operates on tubing ranging from six to 30 feet long.

•

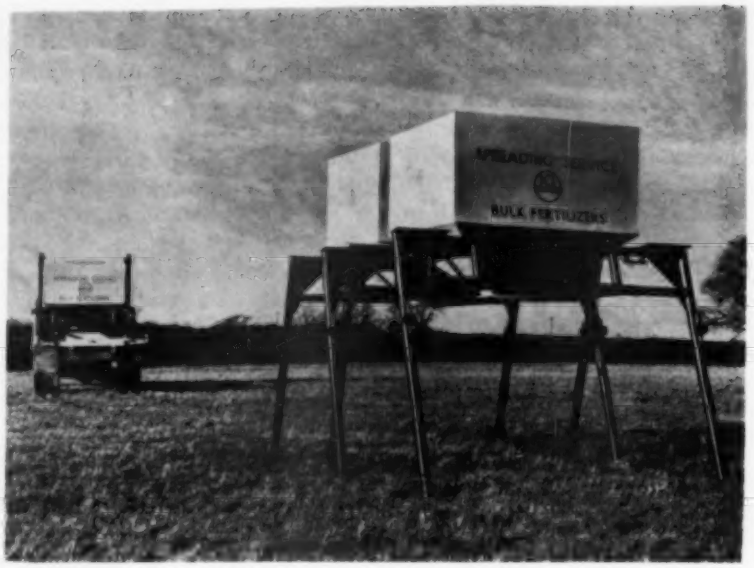
Century Granule Applicator

Century Engineering Corp., Cedar Rapids, Iowa, is offering a granule applicating kit that can be attached directly to a planter. The kit is available with single or double compartments. The double hopper unit can be used to apply both herbicides and insecticides at the same time. Flow rate of each hopper can be adjusted separately.

New 15 GPA Spray System

Agricultural Aviation Engineering Co., Santa Clara, California announces a new 15 gallon per acre spray kit for Piper Pawnee. The externally- mounted system features the Agavenco 6600 series pump, and its Crop-Line "suck-back" valve together with its sturdy quadrant control system. The pump has a capacity of 120 gallons per minute which, in combination with the 1¼ inch flow Crop-Line valve, permits a delivery of 15 gallons per acre with a 40 foot swath. The pump and valve are modular in construction to permit removal of stopages or even complete overhaul without the removal of the component or disconnecting the plumbing. Descriptive literature on the pump and valve components and a complete installation drawing on the system may be obtained from the company.

When the bins have been erected on the farm, the truck drives away and the bins are ready to service the applicator's spreader trucks.



Experiments by Imperial Chemical Industries Ltd., aimed at finding a more efficient way of handling and distributing bulk fertilizers, have resulted in the development of a system which involves the establishment of bulk stores combined with contracting services using portable bins to get the fertilizer to the farms.

I. C. I. Bin System Speeds Bulk Distribution

PIONEER work on bulk fertilizer distribution in Scotland during the past several years has led to the development of a portable bin system by Scottish Agricultural Industries, Ltd., a subsidiary of Imperial Chemical Industries Ltd., London. For three seasons, these bins have been used successfully to distribute fertilizers in Scotland.

The same bins were last year tried, with success, in Dorset, England. This spring, their use has been extended to the whole of the southwest of England, where a network of bulk stores and contracting services has been established. This service is expected to be extended still further next year.

The Dorsett demonstration was conducted by R. C. Rose and Sons Ltd., King's Stagg Mills., Hazelbury Bryan, near Weymouth. Rose and Sons operate from two stores on the quayside at Weymouth which are supplied with fertilizer by cargo boats.

Bulk fertilizer is transported to the farmers' fields by a truck that carries two or three two-ton capacity bins. The bins can be filled in about 20 minutes at the plant by an auger conveyor. Each loading hatch on the bins then is sealed by a tight-fitting rubber cover. To assure correct weight, the truck and the bins are weighed before and after loading.

On the farm, the truck driver raises one bin at a time, a few inches off the truck floor, with a portable jack. Then, special legs fitted on each side of the bin are lowered so that their feet rest on the ground.

The truck then is straddled by the bins and can be driven away for other work. Three bins can be unloaded in less than 15 minutes.

The dealer's distributing truck, which follows the transport truck to the farm, then can be backed under one of the bins and quickly filled by gravity through a simple shutter. It then drives off to spread the fertilizer.

Cost to the farmer for fertilizer handled in this way is about the same as that paid for fertilizer in the bag, plus a delivery and spreading charge per acre. R. C. Rose and Sons make a delivery and spreading charge per acre of approximately 86 cents for an order of two tons applied at the rate of two tons per acre. For an order of six tons or over, there is a charge of 14 cents per acre, if the spread-

ing rate is 400 pounds per acre. These prices cover delivery up to 20 miles from Weymouth. For a 20 to 40 mile radius, the charges are slightly higher.

Since the adoption of the I.C.I. fertilizer delivery and spreading system, R. C. Rose and Sons now sells 400 pounds in bulk for every 100 pounds in bag. Many new customers have been gained, and 90 per cent of the first year's contracts have been followed by repeat orders.

I.C.I. has carried out extensive studies on the whole operation of bulk fertilizer handling and the company is convinced of its economies under many circumstances. The problem of fertilizers taking up water and caking has been solved by improved formulation, I.C.I. reports.

Many farmers using large tonnages of fertilizer are interested in receiving supplies in bulk rather than in sacks. For the smaller farmer, however, the standard multiwall bag has much to commend it. The use of fertilizers in bulk on the farm certainly reduces the labor associated with bag handling, but for small tonnages, the cost of mechanical handling in bulk is likely to be greater than handling bags, even after allowing for the savings arising from buying in bulk. The small fertilizer user, however, can gain the advantages of bulk fertilizers by employing a custom applicator.

In bulk all the way, the fertilizer is loaded at the store by a six-inch portable auger that can fill each bin in about five minutes. When loaded, the truck goes to a scale, to confirm the exact weight of fertilizer and then to the field.

The fertilizer sack, of course, performs many useful services in the distribution of fertilizers, and its elimination would not automatically result in a saving to all fertilizer users. I.C.I. feels, however, that if the manufacturer, the distributor, and the farmer can cooperate to make more economical the whole process of bulk storage and delivery, worthwhile savings to the farmer can become possible.★★

AG CHEM PEST ROUNDUP

by Kelvin Dorward

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head—Survey & Detection Operations, Plant Pest Control Division, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in U.S.D.A.'s pest surveys throughout the U. S.

Japanese Beetle is Found in California for the First Time

THE Japanese beetle was found in Sacramento, California, June 7, when 19 adults were collected in a park area surrounding the State Capitol. By June 16, 319 adults had been collected from 11 properties. Eradication measures were undertaken immediately and plans were to place 2,300 survey traps in the Sacramento area and 500 in adjacent counties. Initial emergence apparently was complete by June 23, and controls were being applied by several types of equipment according to host type. The second treatments had begun in local areas and applications appeared effective. In addition to survey traps, visual inspection, block by block, was being conducted by 20 inspectors in the city of Sacramento.

Prior to this find, established infestations of the Japanese beetle had not been found west of the Mississippi River except at St. Louis, Missouri, and Fort Madison, Iowa.

Screw-Worms Found in Florida

The first screw-worms to be found in a farm animal in Florida since June 1959 were collected near Bonifay, Holmes County, June 18. About 100 larvae were found in a two-week-old pig on a farm. Distribution of sterilized flies has been initiated, areas of the farm chemically treated, and other eradication measures undertaken.

In Texas, there had been relatively few cases of screw-worm through early June. However, showers and other factors were expected to cause an increase during the next few weeks.

Grasshopper Outbreak

Grasshoppers were causing severe damage to rangeland and crops in several States. Drought conditions were also adding to the problem by driving the insects into the crops. In North Dakota, a cooperative Federal, State, rancher control program was initiated by the middle of June to treat an area of about 52,000 acres southwest of Watford City, McKenzie County. Threatening to severe populations also were reported from Williams, Billings, Golden Valley, Slope, and other western and northwestern counties. Control programs were underway in most areas.

Grasshopper control was underway in northwestern South Dakota. Many infestations were reported from Dewey and Perkins Counties. In Montana, the Counties of Dawson, Wibaux, and Richland had damaging populations on the range. Portions of Sheridan, Roosevelt, Big Horn, and Rosebud Counties also were threatened with heavy 'hopper populations.

Grasshoppers in damaging numbers were reported from localized areas of New Mexico, Texas, Oklahoma, Minnesota, Utah, and Washington.

As of June 30, contracts had been let by the Federal Government for treating 350,000 acres in Montana, 63,000 acres in North Dakota, and 40,000 in Washington. In California, over 10,000 were treated earlier in the year.

General Conditions

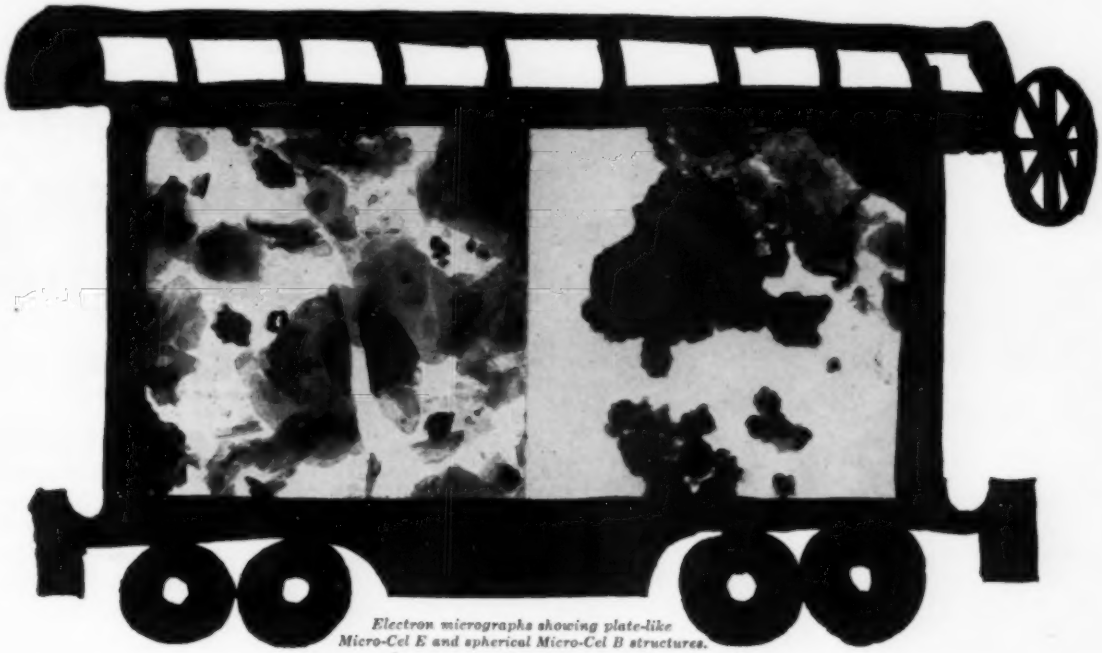
The armyworm was responsible for entirely destroying a few oat fields in some northeastern North Carolina counties. The insect reached outbreak proportions in local areas of Northampton, Southampton, and Isle of Wight Counties, Virginia. In Maryland, several moderate to heavy infestations in small grain and corn occurred in Dorchester and Worcester Counties. Damage to barley, wheat, and fescue was observed in central and northeastern areas of Missouri. Treatments were applied in the southwestern part of Illinois, where counts varied 7-30 larvae per square foot in lodged wheat.

The alfalfa weevil continued to be of concern in several areas. In Pennsylvania, infestations were running higher than anticipated. Larvae were collected in Armstrong County for a new county record. Massachusetts populations were heaviest along the southern border but no general damage occurred.

Damage has increased greatly in the Hudson River Valley since early June. In one field of the area, larvae averaged 6,000 per 100 sweeps. In Rhode Island, adults were active in the Kingston area, but populations remained well below economic levels on alfalfa. Populations varied locally from light to heavy in Virginia, Maryland, New Jersey, and Delaware.

The alfalfa weevil was on the increase in many areas of Wyoming. In Utah, many growers were

(*Continued on Page* 73)



Electron micrographs showing plate-like Micro-Cel E and spherical Micro-Cel B structures.

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2 Michigans, special equipment, reduce operating costs for Cargill, Inc.

Simply taking advantage of a manufacturer's optional equipment has enabled Cargill, Inc. to adapt two Michigan Tractor Shovels to material handling jobs that otherwise would require larger, more expensive machines.

Required—compact machine with extra high dump

At Cargill's Omaha, Nebr. warehousing subsidiary, Cargo Carrier Inc, material handling is almost fully automatic—conveyors carry bulk fertilizer and rock salt from hoppers to bin, bag and box car. But in two important areas, material handling is assigned to Tractor Shovels—transporting materials from bins to hopper...and truck-loading out of bins. Both jobs pose special problems.

For example, bulk truck-loading requires a machine that can maneuver in cramped bins, around close-spaced support posts, through a low clearance door . . . and still dump into huge transport trucks. A compact 77 hp Michigan Model 75A proved perfect for bin operations, and its 1¼ yd bucket provided the required capacity. But dumping height (9′7″) was insufficient to clear the 10′2″ high sides of 20 ton trucks. The solution: optional high-lift arms which gave 2′2″ more clearance than the rig's standard arms.

Required—small machine with extra big capacity

The other assignment—moving fertilizer from bins to hopper—calls for a much more compact Tractor Shovel . . . one that can maneuver through aisles and bin openings *only 6 ft wide and 6 ft high*. Here the Model 12B (smallest of the nine-model Michigan line) proved the perfect size. But its standard 16 cu ft bucket was too small to transport enough fertilizer to meet Cargill's production needs. One obvious solution, add another machine, was not practical due to cramped quarters and added costs.

The answer: fit the 44 hp Model 12B *with a one yard bucket* (one of six bucket options on this machine). After all, fertilizer is relatively light weight—about 60 lbs/cu ft—a yard would weigh well under the Michigan's 2900 lb capacity. Nor would the extra 12″ bucket width (62″ total) pose any maneuverability problem.

Production high . . . availability excellent

Cargill reports complete success in both applications! The Model 75A loads 20 ton trucks in less than 10 minutes, 14 passes, 100 ft one-way trips bin to truck. The Model 12B feeds hoppers for both bagging and railway box car loading, often works 24 hours a day, handling granulated fertilizer.

"We consider high output plus excellent availability Michigan's biggest benefits," summarizes Plant Supt Merle Bruce. "A fertilizer plant like ours offers difficult working conditions for the Michigans—dust, cramped quarters, round-the-clock duty—but in two years neither Michigan has given us a bit of trouble . . . or held up production."

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AG CHEM LISTENING POST

by Paul Miller

This department, which reviews current plant disease problems, is a regular feature of AGRICULTURAL CHEMICALS. The comments are based on observations of collaborators of the Epidemiology Investigations, Crops Protection Research Branch, USDA, Beltsville, Md.

Control Of Pepper Bacterial Spot By Spraying Foliage

IN 1960 D. F. Crossan, D. J. Fieldhouse, P. P. Burbutis, W. W. Townsley, Jr., and Robert VanDenburgh (1), of the Delaware Agricultural Experiment Station, conducted experiments to study the influence of soil-fertility levels and copper fungicides on the amount of bacterial spot (*Xanthomonas vesicatoria*) on pepper. In summarizing the results of three tests, one of which was on a commercial basis, in which various rates of fertilization were compared with or without the use of fungicides, they stated that leaf fall and fruit spot due to the bacterium were markedly reduced by the use of from 1500 to 5000 pounds per acre of 10-10-10 or 3500 pounds per acre of 6-12-12 fertilizer. Where 500 to 1000 pounds of 10-10-10 or 1000 pounds of 6-12-12 fertilizer per acre was used, both leaf fall and fruit spot were severe. At the lower levels of fertilization, copper foliar sprays (Tribasic Copper Sulfate or bordeaux mixture) provided excellent control of bacterial spot.

Dyrene Phytotoxicity

Results of experiments by John Paul Jones (2), of the Gulf Coast Experiment Station, Bradenton, Florida, confirmed reports of toxicity of 2,4-dichloro-6-(*o*-chloroanilino)-*s*-triazine (Dyrene) to tomato. The conditions conducive to injury are still to be determined, however, since analysis of the experimental records did not indicate any definite association of injury with specific environmental conditions or growth stages. Dyrene, Dyrene plus maneb, and Dyrene plus Tribasic Copper Sulfate (TBCS) were compared with a maneb-zineb alternating schedule. The fungicide combinations, except Dyrene plus TBCS, which some growers apply in early fall to control bacterial spot (*Xanthomonas vesicatoria*), were those currently used by Florida commercial growers. Tecmangam (75W $MnSO_4$) was added to Dyrene for one treatment and to Dyrene plus TBCS for another. All mixtures included two insecticides. West Coast Florida growers include fungicides, insecticides, and minor elements in their spray programs and usually mix all together in the same tank, according to Jones, and this procedure was followed for the experiments.

The fungicidal effectiveness of the mixtures was measured by the extent to which gray leaf spot (*Stemphylium solani*) was controlled. All Dyrene treatments proved much more effective than the maneb-zineb schedule. Fungicidal effectiveness of Dyrene apparently was not decreased by any of the materials added in the combinations tested.

All Dyrene treatments resulted in some foliage and fruit injury. The Dyrene plus TBCS mixtures were extremely phytotoxic. Mixtures containing Dyrene without Tecmangam also caused very severe injury. Fruit injury was much reduced when Tecmangam was added to Dyrene. On the other hand, addition of Tecmangam to the Dyrene plus TBCS mixture slightly increased fruit injury. Symptoms of phytotoxicity associated with the Dyrene treatments included leaflet crinkling and distortion, sometimes so severe as to cause splitting of the leaf blade, leaf and stem necrosis, slight stunting of the plants, shallow pitting of the fruit pericarp, and decreased fruit set.

Jones concluded that since Dyrene is so effective and currently so widely used in spite of its phytotoxicity, studies should be continued to determine the conditions under which it causes injury.

Sting Nematode Control

According to J. N. Sasser and W. E. Cooper (3), of the North Carolina Agricultural Experiment Station, the sting nematode, *Belonolaimus longicaudatus*, is a widespread and important cause of loss in the peanut belt of North Carolina. An efficient means of chemical control is desirable because many crops commonly grown in rotation with peanuts are also susceptible to attack by the nematode. One of the chemicals that have been tested is *O,O*-diethyl *O*-2-pyrazinyl phosphorothioate (EN 181-33). Sasser and Cooper analyzed results of 1960 experiments with this chemical, with special attention to the relation of nematode control to yields, quality, and market price of the crop. They used a 10 percent granular formulation. Surface applications to the row at planting time at the rates of 4, 8, and 16 pounds per acre of active ingredient resulted in yields of

(*Continued on Page 74*)

AG CHEM

Fertilizer Views and News

by Vincent Sauchelli

Dr. Sauchelli is a Consultant to the Agricultural Chemicals Industry.

Oversimplification Of Scientific Facts Can Be Misleading

WE are in that position in science today where we are learning more and more about less and less. This seeming paradox emphasizes that in the pursuit of knowledge researchers are constrained to work more and more intensively in an ever narrowing area of their chosen field. New techniques, improved instruments, better correlated scientific data make possible this intensive exploration of each fragmented section of the unknown. Two generations ago, for example, one person could adequately occupy the Chair of Natural Science in a university; today a score of persons is required to teach the several branches of that same discipline.

This prelude was prompted by some recent observations and lecture disclosures on soil fertility at a symposium on this subject. The information served to show that when explaining complex scientific developments to laymen it is necessary to simplify and to eliminate the symbols and jargon peculiar to the subject; but, only too often, the result is oversimplification and, possibly, an unintentional misleading of the reader. An example will illustrate: Some suppliers of water-soluble phosphatic fertilizer advertise that their product will produce higher yields because the phosphate, being water soluble, remains so in the soil and therefore feeds the crop quicker and longer. Does not the plant root absorb nutrients only when they are dissolved in the soil solution? Of course it is a plausible, persuasive claim. But, how true is it? What are the soil chemical facts?

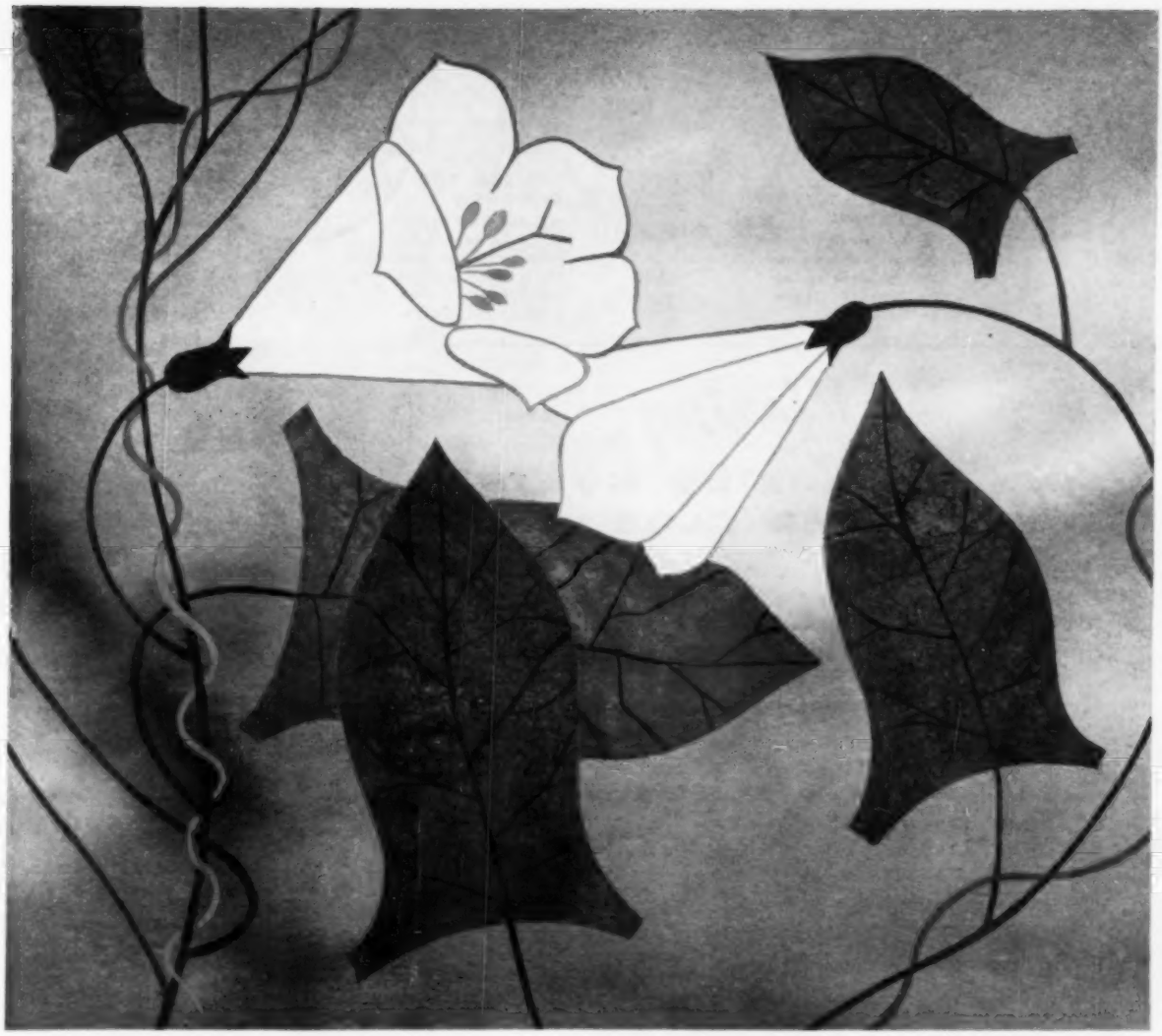
Scieatists at the Tennessee Valley Authority have been studying the chemical reactions following the application of water-soluble phosphate to the soil. An immediate chemical reaction occurs in a moist soil and the original soluble phosphate loses its identity quite rapidly. A number of new compounds are formed having different properties and behaving differently from the original phosphate. For example, they determined that among the products thus formed are less water-soluble dicalcium phosphate and several complex phosphates comprising aluminum, iron, potassium, ammonium, calcium, and different amounts of water of crystallization. They were able to identify potassium aluminum phosphate $H_2Al_2K(PO_4)_3 \cdot 6H_2O$; potassium taranakite, $H_6Al_5K_3(PO_4)_8 \cdot 16\,H_2O$; $AlPO_4 \cdot 2\,H_2O$; and $FePO_4 \cdot 2\,H_2O$. When neutral ammonium phosphate solutions were applied to a calcareous soil, other kinds of complex compounds were formed among which they identified magnesium ammonium phosphate, $MgNH_4(PO_4) \cdot 6H_2O$, and aluminum ammonium phosphate.

Thus we see the crop plant does not feed on the original water-soluble phosphate because it does not remain as such for any appreciable time. The plant has to obtain its phosphorus from several quite different compounds which are formed from the inevitable chemical reactions which ensue after the introduction of the phosphate into the soil medium.

It behooves us all to avoid oversimplifying excessively the phenomena which occur in soil fertility problems. The soil is a dynamic, ever-changing complex medium involving chemical, physical, and biotic interreactions. The availability of phosphorus to plants is a function of the distribution and solubility of soil elements and the products of phosphorus reaction which prevail in the area immediately surrounding the fertilizer granule. Besides these factors, there are the physical characteristics and the volume of soil into which the applied fertilizer diffuses. It is fair to state, therefore, that the amount of phosphorus assimilated by the crop plants is conditioned by the extent of distribution and solubility of the newly-formed phosphatic compounds.

The factors involved in soil fertility are many and diverse. One may be pardoned if he questions the validity of a simple soil test as a basis for recommending the adequate fertilization of a crop. The test oversimplifies or ignores the physical nature of the soil and the chemical and biotic interrelationships which are present. The surprising thing is that despite the paucity of information, many unlettered farmers do get satisfactory results. It is the ones who learn more and more about less and less that become apprehensive. I am reminded of a story which W. M. Fifield, Provost for Agriculture at

(*Continued on Page* 74)



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Oldbury sodium chlorate was the most effective weed killer when it was first placed on the herbicide market thirty-five years ago . . . and it's still the most effective you can use today on such troublemakers as bindweed, Johnson grass, Canada thistle, and Russian knapweed.

Oldbury sodium chlorate *sterilizes* the soil . . . reaches right down to the roots of the weed . . . and keeps working for months.

Oldbury sodium chlorate is inexpensive. For a mere 25¢, you can sterilize 100 square feet of drainage ditch, fence line, or roadway.

Open-head drum empties easily. Oldbury sodium chlorate comes in a fast-opening drum. A single lever seals and reseals the drum with a metal band. Full-open head makes pouring, scooping, or shoveling easy.

Available in 50-, 100-, and 450-lb. sizes.

Technical aid. Full-time Hooker agronomists can help with weed control plans and advise on handling, storing, and using sodium chlorate. Write for descriptive folder.

HOOKER CHEMICAL CORPORATION

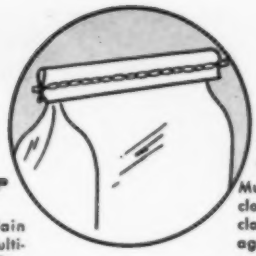
608 BUFFALO AVENUE, NIAGARA FALLS, NEW YORK

HOOKER CHEMICALS PLASTICS

Sales offices: Buffalo, Chicago, Detroit, Los Angeles, New York, Niagara Falls, Philadelphia, Tacoma, Worcester, Mass. *In Canada:* Hooker Chemicals Limited, North Vancouver, B.C.

PLAIN SEWED CLOSURE
The simplest and most popular sewed closure for textile, paper-lined textile and paper bags of all sizes.

FOLDED TOP CLOSURE
An excellent plain sewed closure for multiwall paper bags. Bag top is folded over and sewed through to form a strong, neat closure.

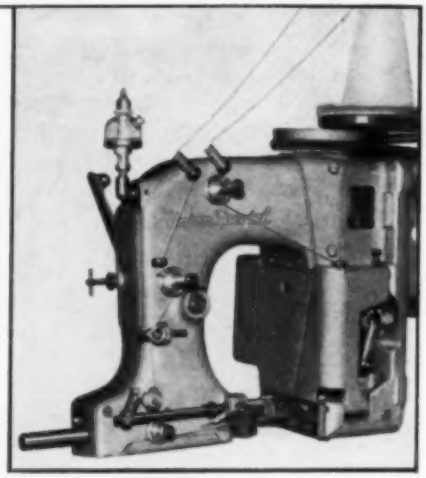


TAPE-BOUND CLOSURE
Multiwall paper bags closed with tape-bound closures add to package sales appeal and provide a bag that can be handled without fear of closure breaks.

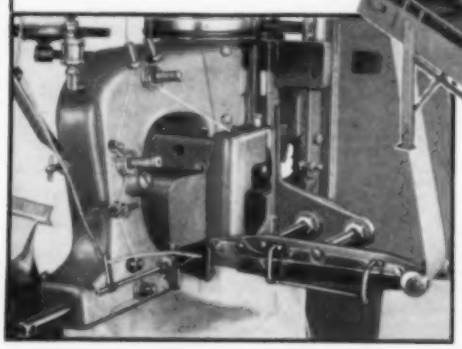
Offering
LOWER PACKING COSTS! BETTER BAG CLOSURES!

If you're interested in bringing packing costs down, here is the way to do it. Take advantage of Union Special's wide knowledge of bag closing and its problems. By selecting your equipment from Union Special's complete line you can get the correct equipment for your particular job — equipment that will do it better, faster and cheaper, giving you a stronger closure at lower cost.

In the Union Special line you will find machines for closing all sizes and kinds of bags from small textile or paper bags up to the largest multiwall paper bags in use today. Whether your production schedule calls for closing just a few bags or for high continuous output, Union Special can supply the equipment to do the work efficiently, economically, dependably! *For detailed information, see our nearest representative or write today.*



CLASS 20500 (left) machines are heavy-duty, high production units for closing medium and heavy weight bags. Available with power-driven horizontal conveyor, inclined conveyor, or both; or with conveyor transmission unit only, for plant production line.



STYLE 80800 H
Sewing Head (left) is designed for making tape bound closure on multiwall paper bags. Automatic tape clipper.

Worldwide Sales and Service

FINEST QUALITY

Union Special® MACHINE COMPANY

447 NORTH FRANKLIN STREET • CHICAGO 10, ILL., U.S.A.

BAG CLOSING MACHINES

NEWS ABOUT THE AG CHEM TRADE

Federal Appoints Two

V. C. Hemeier G. T. Chester

Federal Chemical Co., Louisville, Ky., a division of National Distillers and Chemical Corp., has appointed two division sales managers.

Victor C. Hemeier has been made sales manager of Federal's Butler, Indiana, division. Mr. Hemeier, who has been assistant sales manager at Butler, succeeds Floyd L. Lucas, who retired recently after 36 years with the company.

Guy T. Chester has been named sales manager of Federal's Humboldt, Tenn., division. Mr. Chester has been at Humbodt for 23 years. He replaces W. M. Stallings, who also retired recently.

•

Weed Society To Meet Dec. 11

The Weed Society of America will meet at the Jefferson Hotel in St. Louis, Mo., December 11 to 14. The North Central Weed Control Conference will act as host for the meeting.

•

Heads Sturtevant Board

Clayton F. English, executive vice president and treasurer of Sturtevant Mill Co., Dorchester, Mass., has been elected chairman of the board. He succeeds William T. Doyle, who retired in June. Mr. English joined Sturtevant in 1947.

•

Preliminary ACS Program

The preliminary program for the 140th national meeting of the American Chemical Society, to be held in Chicago, September 3 to 8, has been published by the ACS.

Among the topics listed for discussion at sessions of the Division of Agricultural and Food Chemistry are, "Application of Enzymes to Food and Agriculture," "Pesticide Residues and Food Additives," and "Chelation — Mechanism and Relation to Nutrition." Sessions for this Division will be held in the Palmer House.

•

Mexican Group To Meet

The Mexican Association of Insecticides and Fertilizers Manufacturers will hold its annual convention at La Paz, Lower California, Mexico, November 21 to 24. Headquarters will be at Hotel La Perla.

•

NAC Lists Speakers

Abraham Ribicoff, Secretary of Health, Education, and Welfare, Washington, D. C., will be the speaker at the annual banquet of the National Agricultural Chemicals Association during the group's 28th annual meeting, October 29 to November 1, at The Homestead in Hot Springs, Va.

Other speakers listed on the tentative program for the meeting include Dr. J. O. Rowell, extension entomologist, Virginia Polytechnic Institute, Blacksburg, Va.; Miss Willie Mae Rogers, director of the Good Housekeeping Institute, New York; and Dr. D. A. Spencer, research biologist, Wildlife Research Center, U. S. Fish and Wildlife Service, Denver, Colo.

Also scheduled to speak is Dr. G. Herbert True, assistant professor of Marketing, Notre Dame University, South Bend, Indiana.

P. J. Reno, Hercules Powder Co., Wilmington, Del., is chairman of the program committee for the 1961 meeting.

Head Nitrogen Sales

L. P. Massari

R. L. Tilton

R. L. Tilton has been named general sales manager of the Nitrogen Products Division of W. R. Grace & Co., Memphis, Tenn. He succeeds F. J. Ronan, who has been named vice president in charge of marketing for the division. For the past two years, Mr. Tilton had been sales manager for Grace's St. Louis district. Prior to joining Grace, he directed the promotion of ammonia sales in the midwest for Olin Mathieson.

At the same time, the company appointed L. P. Massari to be assistant general sales manager of the division. In addition, Mr. Massari will continue to serve as urea product manager and export manager, a position he has held for the past five years.

•

Pennsalt Elects McWhirter

James McWhirter, general manager of Industrial Chemicals Division, Pennsalt Chemicals Corp., Philadelphia, has been elected a vice president of the company. He has been with Pennsalt since 1945.

•

County Agents Meeting In N.Y.

The National Association of County Agricultural Agents will hold its 46th annual meeting September 10 to 14 at the Waldorf Astoria Hotel in New York. The theme of the meeting will be "marketing."

Three marketing panels are planned. They will discuss, "New Horizons in Marketing," New Challenges in Marketing for County Agents," and "Marketing in Action for Youth." Herrell DeGraff, Cornell University agricultural economist, will be the keynote speaker.

Stedman Appoints Schneider

The Stedman Foundry & Machine Co., Aurora, Indiana, has appointed Richard E. Schneider as sales engineer for the states of Minnesota, Iowa, Missouri, and portions of Illinois and Wisconsin. His headquarters are in Moline, Illinois.

Before joining Stedman, Mr. Schneider was a uranium consultant in Colorado. He previously had been with Union Carbide Nuclear Co.

•

2 Elected To NAC Board

Howard J. Grady, president, Ortho Division of California Chemical Company, Richmond, California, and Daniel J. Keating, vice president and general manager, Agricultural Chemicals Division, Stauffer Chemical Company, New York, were elected directors of the National Agricultural Chemicals Association at a regular meeting of the board of directors held in Washington on June 6.

Mr. Grady will serve the unexpired term of Fred C. Shanaman, who resigned from the board upon his retirement from Pennsalt Chemical Corporation of Washington. Mr. Keating will serve the unexpired term of George R. Vila, president of United States Rubber Company, who resigned form the board due to press of other commitments.

•

Bradney Joins Hayes-Sammons

Marvin F. Bradney has joined Hayes-Sammons Chemical Co., Mission, Texas, as sales and technical representative. Mr. Bradney is assigned to the company's Indianola, Mississippi, division.

•

Penick Appoints Collins

S. B. Penick & Co., New York, has appointed Richard M. Collins as sales representative for the metropolitan New York area. He joined the company in 1950.

•

Interore Development Group

International Ore & Fertilizer Corp., New York, has announced the formation of an affiliate, International Fertilizer Development Corp., New York. The basic function of the affiliate will be to assist Interore customers with the establishment of new plants.

•

Urea Plant In Alberta

Sherritt Gordon Mines Ltd., Toronto, Canada, has started construction of a urea plant at Fort Saskatchewan, Alberta, Canada. The plant will have the capacity of 35,000 tons per year and will produce urea in both the prill and crystal forms. Production is scheduled to start in the second half of 1962.

All sales will be handled through Harrisons and Crosfield (Canada) Ltd., Toronto, exclusive sales agents for Sherritt fertilizer and chemical products.

•

Miller Joins Texas Gulf

Herbert R. Miller has joined the sales department of Texas Gulf Sulphur Co., New York. He had been vice president of the International Division of Century Chemical Corp.

Heptachlor Tolerance Listed

Residue tolerances for heptachlor and heptachlor epoxide have been established by the Food and Drug Administration on selected food crops. The new tolerances cover combined residues of heptachlor and heptachlor expoxide resulting from application of heptachlor. They are of 0.1 ppm on snap beans, cabbage, lettuce, and rutabagas.

Zero tolerances had been established in early 1960 following findings that a portion of residue of heptachlor converts to heptachlor expoxide.

•

V-C Advances Kelley

Charles H. Kelley has been named manager of the bag division of Virginia-Carolina Chemical Corp., Richmond, Va. He succeeds C. Bruce Rennie, who retired June 30.

In another move, the company appointed Ernest R. Lacy to be sales manager of its mining division.

Reorganization Of United-Heckathorn Is Completed

United Chemetrics is the new corporate name for United-Heckathorn, Richmond, Calif., chemical manufacturer.

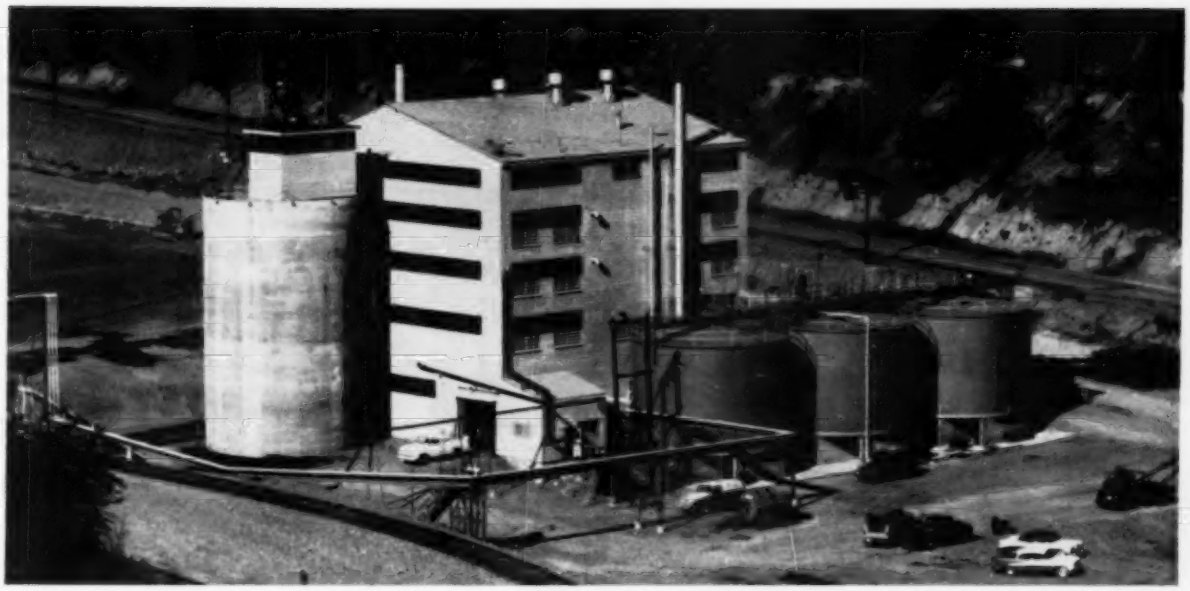
The company feels that its new corporate name more appropriately describes the new corporate makeup of chemicals, real estate properties, and electronics. The properties and electronics business now merged into United Chemetrics were acquired from new board chairman Michael Grayson of Beverly Hills, Calif. The company's head chemical office will remain in Richmond, and the corporate office will be in Beverly Hills.

Mr. Grayson becomes United Chemetrics' controlling stockholder and board chairman. E. S. Heckathorn and L. R. Moretti, major stockholders in United-Heckathorn, have resigned as officers and directors and their stock has been purchased by Mr. Grayson.

The properties include extensive realty holdings in Southern California. National Rocket Co., El Segundo, now is a totally-owned subsidiary of United Chemetrics.

Ivor R. Burden

In the reorganization plans of the company, the major fertilizer and airplane division of the company have been sold and the company plans to consolidate and expand its pesticide business in the West. United Chemetrics now has an authorized capital of 15 million dollars in its capital structure. The officers of United Chemetrics are: Ivor R. Burden, president and chief executive officer; Thomas L. Moore, vice president and secretary; and Philip Earl, treasurer. Mr. Burden formerly was executive vice president.



Aerial view shows the complete Phosphoric Acid Plant of The Bunker Hill Company at Kellogg, Idaho. Three 35' Dorr Storage-Clarifiers are seen in the foreground.

SO_2 from zinc plant opens way for phosphoric acid production at

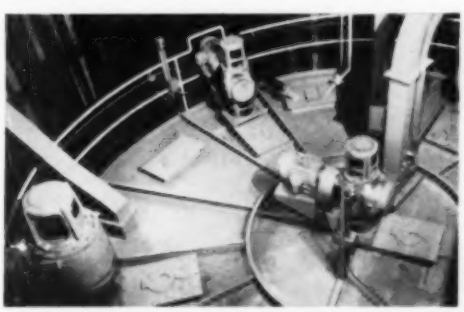
THE BUNKER HILL CO.

Another example of Dorr-Oliver engineering

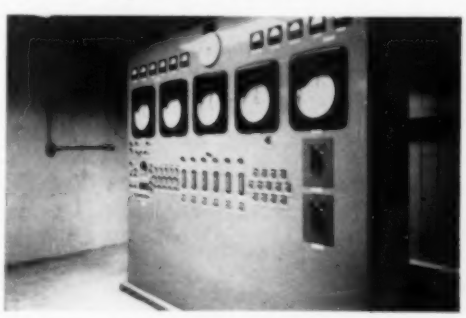
Operated in conjunction with the Company's important zinc reduction facilities nearby, the new Phosphoric Acid Plant of The Bunker Hill Company, Kellogg, Idaho, was constructed in 42 weeks, put into production in January this year, and very quickly achieved capacity and efficient operation. The plant has a design capacity of 130 tpd of 54% P_2O_5 product acid (70 tpd P_2O_5).

The Dorrco Strong Phosphoric Acid Process is used, utilizing Western phosphate rock and sulphuric acid manufactured from SO_2 gas from the zinc plant roasting operation. Complete engineering, plant design, purchasing of equipment and supervision of erection and initial operation were handled by the Dorr-Oliver organization.

Selection of Dorr-Oliver was based on over 40 years of experience in constructing wet process P_2O_5 and complete fertilizer plants throughout the world. For information on the complete range of D-O engineering services available to the Fertilizer Industry, write to Dorr-Oliver Inc., Stamford, Connecticut.



Top view of newly-developed Dorr-Oliver Single Tank Reactor used in this plant for the first time.



The entire plant operation is controlled from this central instrument panel.

DORR-OLIVER

WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

Agricultural Chemical Service Company Personnel

The staff of the Agricultural Chemical Service Company is shown in this photo taken before the company's main plant in Montgomery, Alabama. G. R. Williamson, president of the company, can be seen in the center of the front row. The company was the first pesticide formulator to be established in Alabama.

Cyanamid Moves To Jersey

The executive offices of American Cyanamid Company's Agricultural Division have moved to the company's new agricultural center in West Windsor Township, three miles southwest of Princeton, New Jersey.

Included in the move are the division's marketing, manufacturing, technical service, accounting, personnel, and other service groups formerly located in New York, as well as research and development groups formerly located at Cyanamid's Stamford, Conn., and Pearl River, N. Y., laboratories.

•

Graham Joins Collier

Burton W. Graham has been named vice president of marketing by Collier Carbon and Chemical Corp., Los Angeles, Calif. He had been director of sales for Armour Industrial Chemical Co.

•

CACA To Hear Flemming

Hugh John Flemming, Minister of Forestry for Canada, will be among the speakers at the meeting of the Canadian Agricultural Chemicals Association, Sept. 18 to 20, at Mont Tremblant Lodge, Mont Tremblant, Quebec. He will discuss the program of the Department of Forestry, with particular regard to pest control and research.

Other speakers include Dr. H. L. Patterson, president, Agricultural Institute of Canada, and director, Economics Division, Ontario Department of Agriculture, who will discuss the future use of agricultural chemicals, and Ernest Mercier, Deputy Minister of Agriculture, Province of Quebec.

•

Joint Biological Meetings

The 1961 annual Joint Meetings of Biological Societies will be held, August 27 to 31, at Purdue University, Lafayette, Indiana.

•

Anti-Feeding Compound

University of California entomologists have reported that an experimental chemical — known as "anti-feeding compound 24055" — provides outstanding control of lettuce loopers and clothes moths. The new material, believed to be an anti-metabolite, apparently works by subtly interfering with the life processes of its victims.

Field experiments with the anti-feeding compound are continuing with chewing pests other than the lettuce looper. W. Harold Lange, of the Department of Entomology at Davis, says that "It is one of the more promising non-toxic compounds."

•

Revised Compilation Of Laws

A revised edition of the "Compilation of Economic Poisons (Pesticides) Laws" has been published by the Chemical Specialties Manufacturers Association, New York.

The book brings together in one volume the Federal and States laws and regulations of special interest to manufacturers, packagers and sellers of insecticides, fungicides, rodenticides, and many related products. It also includes the model law, summary tables, related laws directly applicable to economic poisons and pesticides, names of enforcement officials with addresses, table of contents, and index. The price is $18.00 per copy.

•

Insecticide Kills Tampa Children

Exposure to parathion insecticide was responsible for the death of two Tampa, Florida children, June 19, according to Dr. James B. Hutcheson, Tampa pathologist. Three other children who handled a bag filled with the insecticide were hospitalized, but recovered.

•

Fluoride Firm Bought

American Fluoride Corp., New York, manufacturer and distributor of insecticides, rodenticides, and fluoride compounds, has been acquired by Alexander M. Phillips and Harvey W. Rambach. The company will be affiliated with Rambach Chemical Co. and American Firstoline Corp.

•

To Expand Plant

Coastal Chemical Corp. plans a $4.5 million expansion of its anhydrous ammonia plant on Bayou Casotte, near Pascagoula, Miss. The project, scheduled to get underway this fall, will double ammonia capacity to 410 tons per day.

•

Service Award To Johnson

J. R. Johnson, Georgia Extension Agronomist, received the Outstanding Service Award from the Georgia Plant Food Educational Society at the group's 10th anniversary meeting at Jekyll Island, Ga., June 7.

DUSTS
STAY **STRONGER**
FLOW **FREER**
FORMULATE **FASTER, BETTER**
WITH

VICTOR
STABILIZED **T80**

METHYL PARATHION

Methyl parathion dusts stay at top field strength when you formulate with Victor's new Stabilized T80*.

Stabilized T80 is less sensitive to heat and hydrolysis...less likely to lose strength due to catalytic activities of certain clays.

Less solvent means less liquid to absorb and less spray time in formulating both dust concentrates and field strength dusts. With Stabilized T80 your formulations are "drier," more free flowing, subject to less weight loss through evaporation.

For more complete information write to Victor Chemical Works for your free copy of our report, "Victor Stabilized T80."

*Victor's stabilized methyl parathion, 80% technical.

VICTOR *Chemicals*
DIVISION OF STAUFFER CHEMICAL COMPANY
155 N. Wacker Drive, Chicago 6

Federal Acquires Omaha Firm

Federal Chemical Co., a division of National Distillers and Chemical Corp., has completed arrangements to acquire Farm Fertilizers, Inc., through an exchange of stock. Farm Fertilizers is a manufacturer of pelleted and liquid fertilizer with a major plant in Omaha, Nebr., and two smaller plants at Fremont, Nebr., and Webster City, Iowa.

Farm Fertilizers will become an integral part of Federal Chemical, increasing to 10 the number of its plants. Federal is headquartered at Louisville, Ky.

•

Naugatuck Names McCleary

Dr. Charles D. McCleary has been appointed director of research and development for the Naugatuck Chemical division, United States Rubber Co., Naugatuck, Conn. He replaces Dr. Wesley S. Coe, who has been elected managing director of Petroquimica, S.A., a company recently formed by five companies, including U.S. Rubber, to build a large petrochemical complex in Argentina.

•

Manager of Huber Lab.

Richard H. Roberts, Jr., has been named manager of the J. M. Huber Corp. laboratory in Borger, Texas.

The recently-enlarged laboratory is engaged in research and technical service for Huber's carbon black, kaolin clay and chemical products. Before joining Huber, Mr. Roberts was with the Dow Chemical Co.

•

Niagara Adds Three

Three additions recently were made to the staff of the research and development department of Niagara Chemical Division, FMC Corp., Middleport, N. Y. They are Dr. Jerold W. Bushong, plant pathologist; Dr. Kenneth R. Wilson, organic chemist; and Dr. Leonard B. Hertz, field research biologist.

Dr. Bushong, who will be concerned chiefly with fungicide and nematocide screening, is assigned to the Middleport laboratories. Dr. Wilson, formerly with E. I. du Pont de Nemours & Co., in Buffalo, will work with the company's organic synthesis program. Dr. Hertz will work with Niagara's field research and experiment station contact staff.

Insanity Blamed on Insecticide

In a recent issue of Lancet, a publication of the British Medical Society, 16 cases of temporary insanity among Australian farmers were attributed to prolonged exposure to organophosphorous insecticides. The article reported that the workers had undergone exposure of a year and a half to two years and that all had developed either schizophrenia or abnormal cases of depression. Most of the cases continued to suffer for as long as six months after exposure terminated, but then returned to normal mental health within another six months.

Southern Nitrogen To Expand

Southern Nitrogen Co., Savannah, Ga., plans a $5 million expansion program that includes the construction of additional facilities at Savannah to increase anhydrous ammonia production by 50 per cent. The new facilities are expected to be in operation by July 1962.

The company now is expanding its nitric acid and ammonium nitrate production at Savannah.

•

Central Buys Cannery

Central Chemical Corp. of Hagerstown, Md., which has occupied the Green Giant cannery at Martinsburg, Pa., since 1960, last month exercised its option to purchase the property. Included in the transaction were 20 acres of ground, a 22,500 foot warehouse, the former processing building, and several smaller structures.

•

Correction

In our report about the reorganization of the NAC staff (July, page 65), we indicated that the plan already has taken effect. This is in error. It will be effective on September 1.

V-C Buys Sulphur Interest

Virginia-Carolina Chemical Corp. has purchased a 20 per cent interest in Texas International Sulphur Co., Houston, and has named three of its officers to the Texas International board.

As part of the purchase agreement, V-C entered into a 10-year contract to purchase "large quantities" of sulphur from Central Minera, S. A., Texas International's Mexican subsidiary.

•

Armour Names Freeman

Charles H. Freeman, who had been in the manufacturing department of Armour Agricultural Chemical Co.'s Dallas plant, has been appointed plant manager of company's plant in Columbia, S. C.

•

Lundberg Heads Co-op

Kenneth F. Lundberg has been named president of Central Farmers Fertilizer Co., Chicago. Central Farmers is a cooperative made up of 26 cooperatives. Its membership extends across the United States.

Mr. Lundberg, who for 25 years has been with the Western Farmers Association of Seattle, Wash., succeeds Jos. J. Lanter.

•

ICI To Build In Australia

Imperial Chemical Industries of Australia and New Zealand Ltd. will build a plant at Botany, Australia, to produce some 63,000 long tons per year of ammonia, ammonium nitrate, methanol, nitric acid, and urea. Botany is a suburb of Sydney.

•

APS Placement Service

The American Phytopathological Society is offering a placement service that provides the names and qualifications of candidates available for employment in plant pathology. The service is free to APS members and is available to any employers with vacancies. The Phytopathology Placement Service is located at the Crops Research Division, Plant Industry Station, Beltsville, Md.

Montecatini Buys Interest

The Montecatini Co., the largest chemical and mining concern in Italy, and one of the largest in Europe, has purchased about 4 per cent of the stock of Minerals & Chemicals Philipp Corp., Menlo Park, N. J. In addition, Piero Giustiniani, managing director of Montecatini, has been elected a director of the U. S. company.

The shares were bought privately from three officers of Minerals & Chemical Philipp. The two companies intend to work together on a number of "mutually interesting projects," according to James Deshler, chairman of Minerals & Chemicals Philipp.

•

Herbicides In Forestry

A special symposium on herbicides and their use in forestry will be held on the Oregon State University campus, Corvallis, Oregon, Sept. 7 to 9. The meeting has been designed to provide up-to-date information about chemical herbicides and their use in brush problem areas in the Pacific Northwest. One day will be devoted to viewing experimental results of sprayings made on the McDonald Forest, the School of forestry's experimental and instructional outdoor laboratory.

•

Becker Joins Huber

Joachim H. Becker has joined the Chemicals Division of J. M. Huber Corporation in the newly-created position of engineering development manager. He is headquartered at Havre de Grace, Maryland.

Before joining Huber, Mr. Becker was with E. I. du Pont de Nemours & Company in manufacturing and engineering.

•

Wiley Award To Clifford

Paul A. Clifford, bureau of biological and physical sciences, Department of Health, Education, and Welfare (retired), has been selected to receive the 1961 Harvey W. Wiley Award by the Association of Official Agricultural Chemists. Mr. Clifford was cited for, among other achievements, his work on the analysis of organic pesticides that has resulted in widely-used methods for the determination of parathion, of DDT and its isomers, and monofluoroacetic acid in foods.

•

Evans Named By Bagpak

Carlton F. Evans has been named assistant midwestern regional sales manager of International Paper Co.'s Bagpak Division. He joined the company in 1949.

Planters Insecticide Plant

Planters Fertilizer and Soybean Co., Pine Bluff, Arkansas, manufacturers and distributors of Razorback brand fertilizer and fertilizer materials, has announced the formation of Planters Agricultural Chemical Company to manufacture liquid insecticides.

Dr. Paul J. Talley, formerly with Monsanto Chemical Co., is head of the technical staff of the new firm. William Dunklin is sales manager.

BOOK REVIEW

World Survey of Phosphate Deposits, Volume III, West, South, and East Africa. Published by the British Sulphur Corp. Ltd., London.

This is the first of a series of six volumes being published by the British Sulphur Corp. The result of four years of intensive research, the survey covers every known phosphate deposit of commercial interest in great detail. The complete series likely will be accepted as the standard reference work for many years to come.

The remaining five volumes, in order of publication, will be:

Vol IV North Africa, together with U. S. S. R., China, India, Antarctica, and Western Europe.

Vol VI Central America, the Caribbean, and South America.

Vol I Near and Middle East.

Vol V Western States of America and Pacific Ocean.

Vol II Canada and Eastern U. S. A.

WASHINGTON REPORT

(*Continued from Page* 49)

The task is huge, and Dr. York expects to cooperate with all agencies in the various communities — government and industry — to accomplish the aims of raising the economic level of rural communities. A major factor still will be counseling farmers on how to make more money from farming. This will mean greater use of pesticides and fertilizers as part of improved farm management.

A separate development of interest to the Industry can be found in plans of the Farmers Home Administration to increase loans to farmers, big and small, for operating capital. The total for any loan is expected to rise from $20,000 to $50,000 to accomodate the larger operating budgets of today's farms.

Some of these issues, at least, will be discussed at the County Agents meeting in New York, and one point Industry sometimes forgets, county agents make up a major network in communications with farmers and farm people by radio, television, and newspapers as well as directly.

For the record, over 3,000 county agents prepared columns or news releases for newspapers during 1960; 2,224 prepared radio programs, and 1,124 prepared television programs, many on a regular basis, for a total of nearly 600,000 newspaper, radio, and television features during the year. That kind of communications impact upon prime customers can't be overlooked.

NPFI Service To Members

More efficient service to members is one of the untold stories behind the recent budget cut at the National Plant Food Institute. Every private organization, and most governmental ones, adjust from time to time to changing conditions. This, as much as the highly-competitive situation in the fertilizer industry right now, is involved.

As was announced, the budget adjustment will not change programs, or emphasis, but they may involve changes in technique. For example, the Plant Food Institute has cancelled publication of its weekly news review. On the other hand, automated equipment has been put into the association's mail room, and more specific information now is being put into the hands of members who need it and can use it.

At the same time, more general information that went to members via the weekly news review, now is being speeded to trade press and will reach NPFI members and others via these media.

As with all industries, the trend with fertilizer companies and pesticide manufacturers, is toward higher sales and lower profits. Adjustments within companies and their trade associations to produce better results more efficiently is all to the good. This is the story we tell farmers, and it pays off for them.

New Eradication Techniques

Here's one to watch. In the past few years, USDA's Agricultural Research Service has been stepping up efforts to find new techniques for eradicating insects.

One such was the use of gamma radiation to sterilize screwworm flies. This method eliminated the fly from the Southeastern United States, and plans are at least being considered now to erect a "Fly barrier" to intercept screwworm flies which might try to come in from Mexico.

Now, ARS is experimenting with eradication of houseflies in mass. The new twist is that three chemical compounds have been discovered to do the job. One, at least, is effective by oral intake or by contact, and it does not injure or weaken the insect in other ways, as does gamma radiation. Dr. Arthur Lindquist, Chief of ARS' research on insects affecting man and animals, tell us that this chemical, in bait-form, already has been field tested successfully against houseflies.

Though research has not been done on it, the same technique may be usable against such other insects as Japanese beetles. Dr. Lindquist calls this development "the most intriguing" in his many years in entomological research. You may remember that it was Dr. Lindquist's basic research on mosquito control which has led to malaria eradication in the U. S. and the current malaria eradication program around the world.

If chemical insect sterliants can be discovered which are safe from a human standpoint, says Dr. Lindquist, the possibilities of insect eradication are tremendous.★★

H. De Forest Hardinge has been appointed vice president, Hardinge Co., York, Pa., and Hardinge Manufacturing Co.

AC

Robert D. Hack has joined the Chipman Chemical Co., as a sales representative for the San Joaquin Valley of California.

GRANULES

(*From Page* 42)

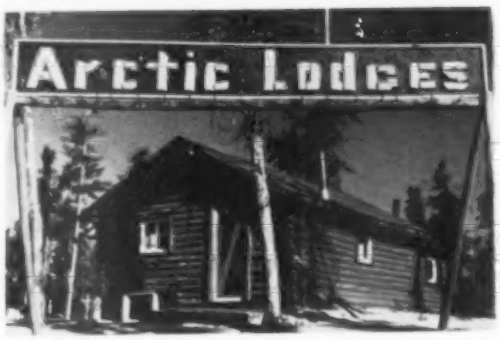
mixed in with the soil to simulate broadcast applications. With a uniform dosage of 1.25 pounds of heptachlor per acre, wireworm mortality was 73% — using a 2% concentration of insecticide on 30/60 mesh attapulgite granules (this provided about 394 particles per pound of soil). Wireworm control at the end of the seven-day holding period was only 20%, when a 20% formulation on 30/60 mesh attapulgite granules was used (provided about 30 particles per pound of soil). Considerable importance is attached to this report, as rapid action against wireworms is needed to keep damage to germinating seed at a minimum.

Insecticide granules in the row have not been satisfactory for cutworm control on corn, as they provide only partial control; with untreated areas showing as much as 7.6% plant severance in some experiments. Granules have worked as well as sprays in broadcast treatments against cutworms.

Winter application of insecticide granules to corn land in Illinois was mentioned. Excellent control of major soil insects by this method has been reported. Insecticides used do not break down under cold conditions, and are worked into the soil during periods of freezing and thawing — to give adequate distribution in the plow layer, following spring plowing or discing of fall-plowed land. This program is suggested only for level fields with little or no spring runoff of water.

In general, Dr. Apple concludes, soil insect control with granular materials has been satisfactory. Because there are many variables associated with granules, much research by entomologists remains to be done — to determine the most desirable formulations for each inert and to approximate the performance of insecticides applied in spray or dust form. In 1961, midwestern entomologists are making a concerted effort to evaluate critically the variables associated with row-applied granules for control of corn rootworm. Factors to be studied include percentage of toxicant on granules, mesh size of granules, calcined attapulgite (LVM) vs. non-calcined (RVM), montmorillonite as compared with attapulgite, and the screening of new insecticides. Added interest in improving granules for corn rootworm control was stimulated by the many treatment failures against the western species of corn rootworm in Nebraska in 1960.

Application equipment is essential to make granular insecticides perform effectively. Equipment manufacturers are dependent on the entomologist and agricultural chemical formulator for standardized granules, and their rates of application for various insects. The distributing mechanism must be designed to meter granules accurately, regardless of the quantity in the hopper, and to place the particles in the most desirable pattern — especially for row treatment on corn. Granular insecticide applicators on the market discharge the granules through a tube, producing a band one to two inches in width — yet this is expected to protect a corn root system which has a vulnerable diameter of four to six inches, insofar as rootworms are concerned. To obtain root worm control with granules in the row — equal to that produced with broadcast treatments, it may require a band six to ten inches wide —thoroughly mixed into the soil above the seed.★★



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SULFUR

(*From Page* 33)

high-carbohydrate food plants as manioc are grown on such a large scale, often to the virtual exclusion of high-protein and high-methionine food products. The vitamin values of foods grown under conditions of sulfur-deficiency, but otherwise well supplied with the nutrient elements, can be raised by the addition of sulfur.★★

EUROPEAN PRODUCTION

(*From Page* 34)

five per cent, to 1,678,000 tons, in 1958-59 and remained at this level in 1959-60. Concentrated superphosphates output, which accounts for about one-eighth of the superphosphate total, rose 12 per cent in 1959-60.

Potash Fertilizers

Both production and consumption of potash fertilizers are likely to rise by some five per cent in 1960-61. In 1959-60, France and Germany attained output figures of 1,530,000 and 1,846,000 tons of K_2O respectively, increases of six and eight per cent. Spanish potash production rose two per cent to reach 249,000 tons, while Italy only recently has begun to mine potash on a large scale and is expected to reach about 40,000 tons in 1960-61.

The upward trend in production of potassium sulfate and high-grade potassium chloride continued on into 1959-60. Consumption of potassium chloride (over 45 per cent K_2O) rose five per cent, and potash sales with less than 20 per cent K_2O rose by 15,000 tons (19 per cent). More than half of the total potash consumption was in the form of potassium chloride (over 45 per cent K_2O).★★

PEST ROUNDUP

(*From Page* 56)

cutting alfalfa for control. Some control was being practiced in areas of Colorado and Nevada. Infestations were moderate to heavy in 10 percent of the alfalfa fields in northern San Juan County, New Mexico. Heavy populations were present in Siskiyou County, California, and considerable foliage injury was evident in Malheur County, Oregon.

Colorado potato beetle was building up in several areas. Truck crops were being damaged in localized areas of Oklahoma. The insect was rather heavy in some areas of the Virginia Eastern Shore, and all stages were present on potatoes and tomatoes on the Eastern Shore of Maryland. Increases were noted from areas of Delaware, New Jersey, and New York. Egg mass counts were the highest in several years in areas of Grand Forks and Walsh Counties, North Dakota, and larvae were scarce to abundant in potato-growing areas in Michigan.

In Jerome, Jerome County, Idaho, a single overwintered Mexican bean beetle was collected in early June. This is the area designated as an outbreak area in 1960, and in which eradication measures were undertaken. It is expected the same measures will be taken in 1961 to eradicate the pest.

Boll weevil activity has generally been slow this spring, but rain in recent weeks has caused an increase in emergence and activity. In South Carolina, activity increased in late June and overwintering weevils continued to emerge in Georgia, Alabama, and Arkansas. Very light infestations were reported from the Mississippi delta area, but no mass movement was indicated. In Texas, infestations were generally light, but in the south central areas some fields had counts as high as 90 percent infested squares.

Cankerworms were rather serious in some areas during June. The insects were heavy throughout New York, with all types of foliage being attacked in Westchester County. Severe infestations were

reported on oaks on Long Island and on most all foliage in Erie County. Defoliation was reported from Pennsylvania and central and southern Connecticut.

Brood I of the periodical cicada was reported from Bedford, Roanoke, Shenandoah, Botetourt, and Rockbridge Counties, Virginia, during June. Cicadas also were reported from Chester and Huntington Counties, Pennsylvania, and Washington, Hocking, and Jackson Counties, Ohio. Reports were received from New York, but counties were not listed.★★

FERTILIZER VIEWS

(*From Page 60*)

the University of Florida, tells about one of his college classmates: "John was a fairly successful orange grower before he matriculated at the University. After our four years of study John said to me: 'Bill, I thought I knew something about growing oranges before coming to college. Now that I am graduating, I am afraid to go back to the job of raising citrus.'"★★

LISTENING POST

(*From Page 59*)

2275, 2554, and 2816 pounds per acre, valued at $260.26, $303.67, and $329.19, respectively. The corresponding figures for nontreated plots were 787 pounds and $73.74 per acre. Broadcast applications at the rate of 16 pounds per acre (active), disked in 6 days before planting, resulted in a yield of 2633 pounds per acre valued at $295.95, compared with 1581 pounds per acre valued at $162.68 for the nontreated plots. In both row and broadcast treatments, the yield and acre-value increases were directly correlated with reduction in populations of the nematode.

Sasser and Cooper concluded that because of simplicity in application, low phytotoxicity, as evidenced by the fact that planting can immediately follow treatment, and efficient results, the chemical showed much promise for use as a control for the sting nematode.

Broad-Spectrum Fungicide

Control of several soil fungi is a prerequisite to successful production of vegetables in the intensive truck crop sections of coastal South Carolina, according to Wayne R. Sitterly (4), of Clemson College Truck Experiment Station, Charleston, South Carolina. As examples of the problems faced by growers there, he mentioned the prevalence of stem and fruit rots (*Sclerotium rolfsii* and *Rhizoctonia solani*) of tomato, fruit rot (*Pythium* and *Rhizoctonia* species) of cucumber, Rhizoctonia root rot and Pythium damping-off of beans, and seed decays caused by various unspecified soil-borne organisms. During a search for a fungicide that would be effective against a number of soil fungi, 5-chloro-4 - phenyl-1,2 - dithiol-3-one (H3944, produced by the Hercules Powder Company for experimental use only and not commercially available) was compared with several other chemicals.

Seven of the 11 vegetable crops included in a seed-treatment test showed statistically significant increases in stand from treated seeds: of the seven all responded to treatment with H3944, six to treatment with thiram, five to treatment with the zinc salt of pyridinethione 1 oxide (Omadine zinc), and four (the same four) to treatment with captan and chloranil. In an experiment on soil treatment for the control of southern stem blight of tomato, caused by *Sclerotium rolfsii*, H3944 and $Ca(NO_3)_2$ were about equally effective and were superior to other treatments in both spring and fall plantings, whereas PCNB was as good as these in the fall planting but not in the spring planting. Soil treatments were also used in trials for control of Pythium and Rhizoctonia fruit rots of cucumber. Only H3944 effected a significant reduction in amount of fruit rot. Older leaves of cucumber plants in plots treated with H3944 suffered some marginal leaf scorching, but the plants apparently recovered without permanent injury.

Sitterly concluded that H3944 apparently is effective against a number of soil-borne fungi. He added that the method of application does not seem to affect the fungicidal activity of the chemical. In the seed treatment tests, it was applied as a dust; for the control of *Sclerotium rolfsii*, it was applied to tomato plants in the transplant water at transplanting time; for control of Rhizoctonia and Pythium fruit rots of cucumber, it was applied as a spray on the soil surface around the plants after the last cultivation.★★

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(1) Crossan, D. F., D. J. Fieldhouse, P. P. Burbutis, W. W. Townsley, Jr., and Robert VanDenburgh. 1961. Control of pepper bacterial spot by fertilizer and by foliar Sprays. Plant Disease Reporter 45: 120-123. February.

(2) Jones, John Paul. 1961. Dyrene phytoxicity effects on tomato. Plant Disease Reporter 45: 168-172. March.

(3) Sasser, J. N., and W. E. Cooper. 1961. Influence of sting nematode control with *O,O*-diethyl *O*-2-pyrazinyl phosphorothioate on yield and quality of peanuts. Plant Disease Reporter 45: 173-175. March.

(4) Sitterly, Wayne R. 1961. A new broad spectrum soil fungicide. Plant Disease Reporter 45: 200-202. March.

REGULATIONS

(*From Page* 21)

tact. Up to a point, there is no doubt but that administrative bodies attempt to serve the economic or social group which they regulate, but they have a political responsibility and they represent government as part of the executive branch. As such, they cannot possibly speak for farm people or for any other group affected by the legislation which they are attempting to persuade the public and the legislature to accept.

It is doubtful whether any Study Commission composed entirely of bureaucracy can ever come up with acceptable solutions unless, or until, they are equally weighted with representatives of those groups who are most directly affected by the proposed legislation. Certainly, they are not able to come up with good legislation by ignoring the fact that the farmers study these issues, formulate a policy, and hire legislative agents to represent them. It has never been suggested that the Department of Agriculture or the Experiment Station take over the lobbying function of the farmers any more than labor unions would suggest that they abdicate in favor of departmental administrative lobbying.

"Empire building" is another facet of bureaucracy. Any good administrative body that can't add more functions, more personnel, and more budget, loses prestige. Deny it who will, the ardent desire for an all inclusive pesticide use Bill is not entirely free from conscious thought of power and patronage. It is most impolite to include such matters in an objective appraisal of administrative bodies and, perhaps, undiplomatic but, to understand each other, we must look at the facts of administration. We have not said it is bad. We just point out that it exists.

Tenacity is the last point in this discussion. No administrative body ever gives up. That being the case, let's start all over again. What can be done to resolve the problem? We want neither exemption from reasonable law nor the burden of unreasonable law. Neither do we want uncontrolled legislative power given to the executive branch.

The public has been told with a great deal of repetition that the use of pesticides absolutely must be regulated. I am no longer sure that this is so, nor am I at all sure that the judgments of administrative bodies are to be more relied upon than the independent decision and judgments which have governed the use of pesticides up to now. Of this we are certain, the answer has not yet been found.★★

INDIA

(*From Page* 23)

other countries furnish a clue as to the need for fertilizers. Take nitrogen, alone. India consumes less per capita than any nation in the Far East where figures are published. It uses one pound compared with 6.2 lbs. in Ceylon, 15.4 lbs. in Japan, 27.4 lbs. in Taiwan. Compared with Denmark, which consumes 48 lbs. per capita annually, the inadequacy of India's fertilizer utilization is dramatically pointed up.

But, according to Dr. Sauchelli, it is far from a hopeless situation. "India," he says, "has a relatively high proportion of land area devoted to agriculture — 40% as compared with a mere 13% in Japan. It has a relatively low number of persons per acre of cultivable land — only 1.3. This is exactly the same as Italy. It compares with 3.2 persons per cultivable acre in South Korea, with 3.7 in Belgium, 4.1 in the Netherlands and 6.1 in Japan. On a minimum basis, India should be using 10 million tons of total plant food annually — a figure that represents half of the total U. S. production.

It could at least double, and, in many cases, treble its present yields." It is this large potential as a market for the U. S. fertilizer industry (which, of course, is not limited by any means to India) that makes it worthwhile for organizations such as Phoscheme of India to offer its services in developing this market. Another new organization, the International Fertilizer Development Corporation** is offering a wide range of technical services. These services will be advisory in character. On request, it will suggest engineering for new plants, give advice on remodeling of old plants, information on new equipment and processes for improved production, and help on specific problems such as quality control, avoidance of air and water pollution and automation of certain operations.★★

**Recently formed by International Ore & Fertilizer Corp., New York, and headed by Christopher J. Pratt, a fertilizer technologist who is co-author of several chapters in the text *Chemistry and Technology of Fertilizers.*

COMINCO

(*From Page 30*)

ing any fine dust present in the fertilizer, is drawn from the top of the receiver to a single cyclone. Recovered dust is returned to the fertilizer fines bin by a dust pump situated below a rotary feeder on the bottom of the cyclone.

Fertilizer drops to the conical bottom of the receiver, and flows through a rotary feeder onto one end of an 18-inch wide distribution belt. The belt runs in the center of the bin almost the full length of the storage building, above the stockpile of fertilizer. A moveable tripper on the belt is used to distribute the fertilizer in the bin.

The main portion of the bin is below ground level and is made of concrete. The floor is 44-feet wide by 192-feet long. Sides slope out at a 45° rise to a vertical height of 28 feet. Above this, vertical concrete walls rise 13 feet to form an area 100 feet wide by 250 feet long. Wood laminated walls continue up to the roof to enclose the storage area.

Fertilizer is reclaimed by a traveling overhead crane (7½ tons capacity) and clamshell, and is dropped into a hopper on one side of the bin. A belt under this hopper withdraws fertilizer at a controlled rate and dumps it into the boot of an elevator. The fertilizer discharges onto a scalping screen which removes lumps, with undersize going to two separate bins, one for each of two bagging units.

From each bin, fertilizer flows into two automatic weigh scales, that fill alternately with 80 pounds of product. The fertilizer then flows into a two-spout St. Regis packer. Self-closing valve type bags are placed manually onto the spouts and are filled and removed automatically. Up to 16 bags per minute can be filled by one machine.

The filled bags fall to a slat conveyor and are carried past a photoelectric counter, drop to a transfer belt, then are conveyed by a Flexoveyer into the boxcar. Two men pick up the bags from the Flexoveyer and stack them in the car. There is a separate conveyor arrangement for each packer. Each packer and crew can bag and load up to 200 tons per shift.

The reclaiming and bagging system is ventilated by means of two cyclones and fans. Collected dust is blown through a batch pneumatic conveyor to the storage receiver cyclone and then is returned to the fines curcuit in the fertilizer section.★★

DEALERS

(*From Page* 16)

We built and furnished a soils-testing laboratory at a cost of about $3,000.

We carry a complete inventory, second to none.

We have raised and maintained our price levels without giving any special deals. This may seem surprising, but our customers actually like it this way, because they can count on service and they know that everyone is treated equally.

We have added two extremely-well qualified men to our field service departments, one an outstanding entomologist.

We did not build our sales or establish our sound financial position by cutting prices or extending loose credit, although we have made mistakes on credit.

We now are recognized by our growers to be giving value for what they pay for materials, which is indicated by our increase in sales.

The growers recognize that our technical men are most competent, judging by the constant demands for their time and the fact that the growers seem willing to follow their recommendations.

A dealer, therefore, *can* fulfill his responsibilities to the grower and can do so to the benefit of all concerned.★★

AG CHEM

Equipment, Supplies, Bulletins

Continuous Uniform Blender

O'Brien Industrial Equipment Co., San Francisco, is offering a bulletin that describes its Impingatron continuous blender, a continuous treating system for granules, seeds, and fertilizers.

Among the features listed for the Impingatron system are the production of granular insecticides of uniform impregnation with less granule breakage and dust content, continuous production, and lower labor requirements. The bulletin, No. 101, describes principles of operation and maintenance. It is available from the company at 1596 Hudson Ave., San Francisco 24, Calif.

•

Weathering Inhibitor

The use of a weathering inhibitor which prolongs the life of unpigmented Tenite polyethylene used in film for greenhouse and agricultural applications is described in Technical Report No. 5, issued by Eastman Chemical Product, Inc., Kingsport, Tenn.

In exposure tests conducted by Eastman, 5-mil polyethylene film fortified with the inhibitor was said to be in good condition after two years — double the longevity of uninhibited polyethylene film. The report is available from the company.

•

Velsicol Film and Manual

Velsicol Chemical Corp., Chicago, recently issued a new 43-page reference manual on lawn and garden insect control, which it is offering to dealers.

Velsicol also has a new film showing all of the common soil pests of corn in the midwest, plus the latest insecticide methods. The film runs about 17 minutes and is available for group showings.

•

Self-Priming Hand Pump

Protek Specialty Co., Bellaire (Houston), Texas, is offering a self-priming hand pump that can be used to transfer fertilizers at a rate of 30 gallons per minute.

•

IMC Offers Sampling Tube

International Minerals & Chemical Corp., Skokie, Ill., is making available a royalty-free license for the manufacture and use of an improved fertilizer sampling tube which it patented earlier this year.

The new tube has been designed to overcome clogging in operation. In addition, the sample receiving slot has been widened to receive the proper proportion of all particles, including the larger particles.

•

Chantland Conveyor Booklet

The Chantland Co., Humboldt, Iowa, manufacturers of materials handling equipment, is offering a complete line of belt conveyors and accessory equipment. A booklet describing the line is available from the company. It lists eight types of power conveyors in addition to various types of wheel and roller conveyors.

•

Ehrsam Bucket Elevators

The J. B. Ehrsam & Sons Mfg. Co., Enterprise, Kansas, has prepared a catalog that contains drawings, dimensions, specifications, and selection tables for the company's line of bucket elevators.

Inglett Batching Unit

Inglett Development & Engineering Associates, Inc., Augusta, Ga., has developed a new approach to batch-weighing of fertilizer materials for dry mixing. In the new unit, IDEA Model 614, the company has combined the advantages of weighing each material separately with the conveniences of controlled, continuous flow batching. The completely automatic units will handle several separate ingredients together, blending them by weight, using only slightly more space than an ordinary bagging machine.

A feature of the unit is that the supply spout automatically revolves to the supply hopper next to receive material and a panel indicates to the lift truck operator the name of the material next to be brought.

Output tonnages ranging up to 60 tons per hour can be acquired with weight accuracies to within plus or minus ½ of 1 per cent. Complete details are available from the company at P.O. Box 177, Augusta.

•

Hooker Technical Bulletin

Typical chemical reactions of hexachlorocyclopentadiene are featured in a technical bulletin offered by Hooker Chemical Corp., Niagara Falls, N. Y. The highly reactive compound is trademarked C-56. In addition to the typical reaction products, the publication covers physical data on C-56 toxicity and lists recommendations for handling the product. Among end products derived from C-56 are pesticides and chemical intermediates having potential application as fungicides.

•

Drop Bottom Blenders

A series of drop bottom ribbon blenders that permit complete discharge the moment the optimum quality blend has been achieved, are being offered by Munson Mill Machinery Co., Utica, N. Y. The drop bottom discharge gates can be as large as the entire bottom of the blender drum.

AG CHEM

CLASSIFIED ADVERTISING

Address all classified replies to Box Number, c/o Agricultural Chemicals, P. O. Box 31, Caldwell, N. J.
Rates for "Help Wanted" advertisements are 20¢ per word; minimum charge $3.00. Rate for individuals seeking employment is 5¢ per word, $1.00 minimum.
Advertisements of machinery, products and services accepted at rate of $10.00 per column inch. Minimum space, one inch.
Copy closing date, 10th of preceding month.
Checks must accompany all orders.

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SALES EXECUTIVE: Well known in the industry with twenty years experience in all of the phases of pest control. Ten years with a top flite company; ten years in business for self. Am moving to Palm Beach, Florida in October 1961. Desire sales position in Florida and will travel Caribbean, Central American and South American countries if necessary. BSA '38, Purdue University. Please reply to Box 314, c/o **Agricultural Chemicals.**

QUALIFIED TECHNICAL SALESMAN for the Southeastern United States. Age 42. 13 years experience in New Product Sales and Research. Have thorough knowledge of credit responsibilities. Prefer new products. Address Box 315, c/o **Agricultural Chemicals.**

ENTOMOLOGIST — 10 years varied experience in laboratory and field work. Desire position with challenge and future — especially laboratory or technical service. Please reply to Box 316, c/o **Agricultural Chemicals.**

AGRICULTURAL CHEMIST: Chemical Engineer, B.S., M.S., 5 years successful and diversified experience in formulations, research, development, plant engineering and management. Unusual knowledge of raw materials, quality control, mixing and grinding. Designed and operated most efficient plant in division of major chemical producer. Desire challenging career with company wishing to enter pesticide field or improving competitive position. Patents, processes and top references. Address Box 317, c/o **Agricultural Chemicals.**

INTERNATIONAL MARKETING EXECUTIVE wishes to relocate to position with challenge and growth potential. Fifteen years international business experience, half in agricultural chemicals. Experienced in foreign licensing, appointment of overseas distributors, contract negotiations at top business and government levels abroad, foreign patents and trademarks. Particularly interested in progressive growing company not currently selling abroad or dissatisfied with their foreign operations. Good technology, strong research and development essential. Address Box 318, c/o **Agricultural Chemicals.**

Carbide Alcohols Data

An 80-page booklet, describing the properties and uses of industrial alcohols, is available from Union Carbide Chemical Co., New York. The booklet contains comprehensive data on 21 alcohols, from methanol to tridecanol. Included is information on physical properties, constant-boiling mixtures, specification limits, test methods, storage, handling and shipping, toxicological properties, and selected literature references.

•

Utility Bucket Elevator

Universal Hoist Co., Cedar Falls, Iowa, is offering the Model U2 utility bucket elevator that is designed specifically for fertilizers, range pellets, and other "hard-to-handle" materials. Suitable for inside or outside installation, the U2 is of extra heavy, single legging type construction.

The U2 is offered in two bucket sizes and in a variety of speeds. Complete information is available from the company.

•

Anti-coagulant Rodenticide

A rodent bait formula with an anti-coagulant base, that is blended with a new combination of attractants, is being offered by the Hub States Chemical & Equipment Co., Indianapolis, Ind.

Called Hubsco-147, the bait is based on the anti-coagulant Alph-acetonylfurfuryl - hydroxycoumar - in. It is a dry bait and is premixed, ready to use.

IS IT SAVING OR COSTING YOU MONEY?

There's more to distribution costs than the price tag on a shipping service. Quite often, the cheapest way is the most expensive in the long run. Look at your whole marketing and distribution set-up. Then consider how KLM can help you in overseas shipping. ■ KLM speed enables your sales manager to make good on short-notice demands; lets him compete in foreign markets through faster delivery. Your production manager, too, can save valuable time on tight production schedules. ■ That's not all. With KLM air cargo you don't have to tie up money in large inventory stocks. You can replace orders fast. Avoid the costly risk of obsolescence. And the shipping time saved means less interest paid on financing charges. ■ Then there's the satisfaction of knowing your shipment is in experienced, able hands. KLM Cargo Representatives at 114 cities in 80 countries are men of decision. They accept full responsibility, get your shipment to the right place at the right time, at the lowest possible cost. ■ So—study every piece in your distribution pattern, and decide for yourself. KLM Royal Dutch Airlines, 609 Fifth Avenue, New York 17, New York.

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INDEX TO ADVERTISERS

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TALE ENDS

THIS year marks the 50th anniversary of the first appropriation by Congress for research in fertilizer technology. It was in 1911 that the U. S. Department of Agriculture was assigned responsibility for this work. At that time, farmers often were more impressed by the dark color and powerful odor of fertilizer than they were by the plant nutrient content. Today, of course, fertilizer value determinations are more scientific and chemical materials now comprise the major portion of fertilizer used in the United States.

AC

Friends of Frank Kennedy (Potash Co. of America), who missed Mrs. Kennedy at the NPFI meeting in June, will be pleased to hear that the Kennedy's have a brand new son, Michael Tobias Kennedy, born early in July. Frank reports that the middle name was inspired by his associate and friend of many years, Tobias Bradley.

AC

A group of Colorado "manure manipulators" are suing the Colorado Department of Agriculture for the return of more than $10,000 they claim has been "extracted illegally and wrongfully" from them. They object to being treated like fertilizer dealers. The group also is asking an injunction restraining the state Agricultural Department from any further attempts to collect a 25-cents-per-ton tax or inspection fee. "Manure manipulators" is the term in the Colorado fertilizer regulations for firms that mix cow, sheep, chicken, and other manures with peat and sell the resulting mixture.

AC

A Toronto nurseryman, Jack R. Allen of Sunnybrook Nurseries, is selling pre-germinated grass seed in refrigerated bags at $3.49 for enough seed to cover 500 sq. ft. of ground. The grass is guaranteed to grow in 48 hours. Strictly for home gardeners, the seed is delivered to stores each Thursday morning during the season. On Monday Mr. Allen picks up what has not been sold. He says that seed left in the bag too long "explodes like popcorn". Next year, he plans to market the pre-germinated grass seed frozen. "Then, all the homeowner will have to do is to thaw and plant."

AC

Two distinguished members of the industry recently were commissioned Kentucky Colonels by Governor Bert T. Combs of the Blue Grass state. The accompanying illustrations show the commissions being presented at the June meeting of the Association of Southern Feed, Fertilizer, and Pesticide Control Officials in Lexington. Top photo shows J. D. Stewart Jr. of Federal Chemical Co., Louisville, presenting a Colonel's commission to Paul T. Truitt, president of the National Plant Food Institute. Lower photo shows Bruce Poundstone, U. of Kentucky, explaining a similar appointment made to Bruce Cloaninger, secretary-treasurer of the Association of American Fertilizer Control Officials.

J. D. Stewart Paul Truitt

Bruce Poundstone Bruce Cloaninger

FROM PLANTING TO PICKING, THE BIGGEST THING IN A TOMATO'S LIFE IS UN-32. HERCULES UREA AMMONIUM NITRATE LIQUID FERTILIZER DELIVERS UN-32 HAS THE FAST-WORKING, LONG-LASTING NITROGEN A GROWING TOMATO NEEDS. FAST WORKING, LONG LASTING NITROGEN IN ALL THREE FORMS: AMMONIA, UREA, NITRATE. UN-32 WORKS EASY, TOO: IN IRRIGATION WATER, OPEN DITCH OR SPRINKLER SYSTEM; OR IN SPRAY APPLICATION BY GROUND RIG OR AIRPLANE. ASK YOUR FERTILIZER DEALER HOW UN-32 CAN GROW YOU THE BIGGEST TOMATOES AROUND. THEY'RE REALLY GREAT.

TOMATOES

COTTON YIELD GETS BIGGER BY THE ACRE ON UN-32, HERCULES UREA AMMONIUM NITRATE LIQUID FERTILIZER. YOUR CROP JUST NATURALLY COTTONS TO FAST-WORKING, LONG-LASTING NITROGEN IN ALL THREE FORMS: AMMONIA, UREA, NITRATE. UN-32 WORKS EASY, TOO: IN IRRIGATION WATER—OPEN-DITCH OR SPRINKLER SYSTEM—OR IN SPRAY APPLICATION BY GROUND RIG OR AIRPLANE. ASK YOUR FERTILIZER DEALER ABOUT UN-32. IT WILL MAKE YOU A BALE OF MONEY.

COTTON

BECAUSE UN-32, HERCULES UREA AMMONIUM NITRATE LIQUID FERTILIZER HAS EVERYTHING IT TAKES TO GET UNDER A POTATO'S SKIN: FAST ACTING, LONG LASTING NITROGEN IN ALL THREE FORMS: AMMONIA, UREA, NITRATE. UN-32 APPLIES EASILY IN IRRIGATION WATER, OPEN DITCH OR SPRINKLER SYSTEM. SPRAY APPLICATION IS EASY, TOO, BY GROUND RIG OR AIRPLANE. YOUR FERTILIZER DEALER CAN SHOW YOU HOW UN-32 CAN HELP GIVE YOUR CROP MAXIMUM EYE-APPEAL AND TRANSLATED INTO CASH. THAT'S NO SMALL POTATOES

POTATOES

IN SPRING A YOUNG BEET'S FANCY TURNS TO UN-32, HERCULES UREA AMMONIUM NITRATE LIQUID FERTILIZER. BEETS JUST CAN'T RESIST FAST WORKING, LONG LASTING NITROGEN IN ALL THREE FORMS: AMMONIA, UREA, NITRATE. COULDN'T BE MORE COMPATIBLE. UN-32 WORKS EASY, TOO: IN IRRIGATION WATER, OPEN-DITCH OR SPRINKLER SYSTEM; OR IN SPRAY APPLICATION BY GROUND RIG OR AIRPLANE. ASK YOUR FERTILIZER DEALER HOW UN-32 CAN GIVE YOU THE SWEETEST BEETS AROUND. THEY'LL REALLY GROW ON YOU.

SUGAR BEETS

HIGHER YIELDS WITH UN-32*

Our West Side Story: West Coast growers can't say enough about UN-32, the high-analysis urea ammonium nitrate fertilizer. Produced at Hercules, California, in convenient liquid form, UN-32 works wonders for any kind of crop. And West Coast fertilizer dealers are pretty keen about the unusual UN-32 advertising campaign which has provoked grower interest, and provided dealers with an extra tool for fertilizer sales.

*HERCULES TRADEMARK

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Agricultural Chemicals Division ***HERCULES POWDER COMPANY*** *Hercules Tower, Wilmington 99, Del.*

DELNAV® METADELPHENE® NITROFORM® THANITE® TOXAPHENE